School of Public Health

Understanding the Knowledge, Attitude and Behaviour (Practice) of Saudi Arabian Patients with Diabetes Type 2

Abdulrahman Habash Alqahtani

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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.
This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Human Ethics

The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007a) updated March 2014. The proposed research study received human research ethics approval from Curtin University Human Research Ethics Committee (RDHS-258-15), and Saudi Ministry of Health, Institutional Review Board (IRB) and Research Ethics Committee approval (15-361E).

Abdulrahman Habash Alqahtani

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Abstract

According to the World Health Organization (WHO, 2013), diabetes resulted in 1.5 million deaths in 2012. In KSA, the country is ranked among the top ten countries with the highest prevalence worldwide. T2DM prevention, self-care and management are cost-effective strategies for minimising the socioeconomic burden of the disease in Saudi Arabia. Previous research findings indicate that the patients' knowledge, attitude and practice (KAP) are crucial in the prevention, management and care of T2DM. The high prevalence of T2DM among adult males and the lack of research focusing on KAP among this population warrant further research.

This qualitative study explored influences of T2DM management among patients in rural and urban populations of Riyadh, Saudi Arabia. The study sample consisted of male patients with T2DM in rural and urban areas who were receiving treatment at clinics. Participants were purposively recruited through primary health care centres. The study only selected consenting male patientswho with aT2DM diagnosis ofat least one year. Participants wereSaudi nationals, wereaged between 35 and 65 years and were based in five urban and five rural regions of Riyadh, which consists of five main geographical divisions.In addition, the perspectives of health care providers working with patients with T2DM in these areas were also explored. The sample consisted of 20 patients and 10 health care providers from rural areas and 20 patients and 10 health care providers from urban areas (Total sample: 40 patients; 20 health care providers).

Data were collected via semi-structured interview by the main researcher who is a trained interviewer. The interviews were conducted in an Arabic language, in a quiet room in the public area of the selected primary health care (PHC) centres, away from noise and other distractions. The interviews were then translated to English.

Data collected were systematically organised through coding to facilitate analysis. The researcher affirmed the accuracy of the transcripts by cross-checking the transcripts and the audio interview. The data was managed using NVIVO version 11. A Grounded Theory approach was adopted to enable the development of theory to describe, explain, and interpret self-care and self-management practices among

male T2DM patients in both rural and urban settings in Saudi Arabia. This approach enabled key themes and sub-themes to emerge from the data.Transferability of the data was enhanced by development of themes through ground theory. To maintain dependibility and determine credibility interviews were transcribed verbatim and reviewed for accuracy. Member checking was employed. To reduce bias and enance confirmability, themes were coded by the author of this study then reviewed and analysed by the research team.

Data analysis resulted in three models, describing influences of T2DM management for rural patients; for urban patients and the perspectives of health care providers on T2DM management. The model describing influences of management for rural patients included five themes: *knowledge and attitude, health service management, finance, physical activity, and healthy eating*. The themes *knowledge and attitudes*, *physical activity* and *healthy eating* include subthemes: *individual, family, and society*. The model describing influences of T2DM management for urban participants includes four themes: *knowledge and attitude, health service management, physical activities, healthy eating.* The themes *knowledge and attitude, physical activity and healthy eating* included subthemes of *individual, family, and society* as their subthemes.

The model describing health care providers perceptions of influences of T2DM management includes eight themes including: *knowledge and attitude, patient acceptance of T2DM, healthy eating, self-care, medication, family and social support, physical activity and awareness/education.*

The findings of thisstudy highlight the importance of enhancing awareness around symptoms, management, and self-care of T2DM, especially in rural areas. In both rural and urban areas it is important community members are able to access healthy food and environments provide opportunity for physical activity. The support of family and other community members is an important factor in self care. Education and support for family members and the broader community is important to facilitate self help strategies while enhancing awareness of T2DM is important to reduce stigma. The study further recommends that health care providers should be supported through professional development opportunities, access to medications and access to appropriateservices

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Abbreviations

KSA Kingdom Of Saudi Arabia
GCC Gulf Cooperation Council
HBM Health Belief Model
HCP Healthcare Provider
UP Urban Patient
RP Rural Patient
RN Rural Nurse
UN Urban Nurse
RP Rural Physician
UP Urban Physician
MOH Ministry Of Health
IDF International Diabetes Federation
IFG Impaired Fasting Glucose
IRB International Research Board
LT Labelling Theory
MENA Middle East and North Africa
PHC Primary Healthcare Centre
SCT Social Cognitive Theory
SDT Self Determination Theory
Dm Diabetes Mellitus
T2DM Type 2 Diabetes Mellitus
UAE United Arab Emirates
USA United States of America
USD United States Dollar
AUD Australian Dollar
WHO World Health Organisation
BMI Body Mass Index
IGT Impaired Glucose Tolerance
CPG Clinical Practice Guidelines
DSME Diabetes Mellitus Self-management Education
HCS Health Care System

Glossary

Gulf Cooperation Council
Regional intergovernmental political and economic union consisting of all Arab states of the Arab. Member states include Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

UAE National
A UAE National is an individual born in, a citizen or inhabitant of The United Arab Emirates.

Ramadan
Ramadan is one of the five pillars of Islam. It is the ninth month of The Islamic calendar and is observed by Muslims worldwide. It is The holy month of fasting (*saum*) where Muslims fast from Sunrise to sunset.

EID
Eid Al-Fitr is known as the festival celebrated when Muslims complete their month of fasting. It is also known in English terms as the sweet festival, or *Ramadan* feast.

Majlis
Majlis is an Arabic word used for a place of sitting and gathering.

Consanguinity
Is a term used to describe an individual who is a blood relation and descended from the same ancestor line as another individual.

Kabsah
It is cooked rice with meat or chicken which is the main dish in KSA

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"He believed he could, so he did"

This PhD is dedicated to my loving and beautiful Mum
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who believed in me, my dreams and vision
and always encouraged me to reach for the stars.
Thankyou mum for all you gave me, for encouraging me
not to be afraid, and for always reminding me that
'if you want to see a rainbow you have to learn to like the rain'

Chapter 1 Introduction

1.1 Chapter Overview

The thesis provides detailed discussion of the research "Knowledge, Attitude and Practice (KAP) regarding Type-2 Diabetes Mellitus (T2DM) among male patients in Riyadh, Saudi Arabia; a qualitative exploration." The thesis comprises of abstract, chapter one which provides introduction, chapter two which provides the literature review, chapter three that contains the methodology of the study, chapter four which describes the results and chapter five which discusses the results and makes comparison to the literature, chapter six which contains recommendations, strengths and limitations of the study and the conclusion.

1.1.1 Introduction

This chapter will discuss background information about Kingdom of Saudi Arabia (KSA), Diabetes in KSA, the research background, aims, objectives and the significance of this study along with a plan of the thesis.

1.1.2 Kingdom of Saudi Arabia

KSA is located in the Arabian Peninsula in Southwest Asia. KSA is one of the largest (2,240,000 km^2) and "wealthy country in the region of Middle east (UN, 2017). "It is a leading oil-producing country and has witnessed massive socioeconomic developments in the past five decades with rapid urbanization and changes in the population lifestyles" (von Herrath, Korsgren, and Atkinson, 2016). KSA shares the bordersin north by Jordan, Iraq, and Kuwait, while Oman and Yemen are to the south, and shares its eastern border with Bahrain, United Arab Emirates, Qatar, and the Gulf. Red Sea is in the west of KSA (see figure 1.1).

Figure 1.1 Map of Saudi Arabia (World News, 2018)

Saudi Arabia is a Muslim country, and it is one of the member of the Gulf Cooperation Council with Kuwait, Bahrain, Qatar, United Arab Emirates, and Oman. The population of Saudi Arabia is 31,787,580(General Authority for Statistics-KSA, 2016). "The capital city of KSA is Riyadh, which is located in the middle of KSA, and its population was approximately 7 million in 2018" (World News, 2018).

KSA was officially rulled by King Abdul-Aziz Bin Saud in 1932. Currently, Salman Bin Abdul-Aziz is the King of Saudi Arabia and the custodian of the two holy mosques (the *Albait Alharam* in Makkah City and the*Almasjed Alnabawi* in Almadinah City).Muslimsall around the world travelsthese Cities and perform the pilgrimage in Makkah each year, which increase the load on the health-care system. The royal government wherein the King is the prime minister, and commander-in-chief of armed forces (General Authority for Statistics-KSA, 2016) owns the Saudi Arabian political structure

1.1.3 Diabetes in KSA

Diabetes' prevalence in the KSA is concerning. The number of people diagnosis with T2DM has exceeded 3.8 million and a majority of those diagnosed havelimited knowledge about the illness and its association with cardiovascular diseases and other diseases.T2DM has at all time been high in Saudi Arabia, affecting productivity.An exploration of the prevalence and related reasons for glucose intolerance amongst Saudi inhabitants in urban and rural societies exhibited that the extent of average random plasma glucose (RPG) from the urban people was significantly larger than that of the rural community. To summarise Khalid's (2017) findings, urbanisation

and the consequential shift in the standard of living to more sedentary movement, with increased-fat diets and obesity, are the major factors of the increased prevalence of T2DM in the Saudi region. “The levels of T2DM amongst the Saudi population aged below 25 years is expected to increase significantly in the 30-year period of 1992-2022 from a ratio of 8.5% to 39.5%, presuming some stabilising of obesity trends, or to 44.1%, estimating uncapped growing obesity inclinations. In men, T2DM occurrence was likely to intensify from 8.7% to 39.2%, with limited obesity movement, or to 41.3%, with enduring linear intensification in obesity trends. Individuals with T2DM could continue asymptomatic for years, and the diagnosis is frequently made parenthetically or whilst complications take place” (Quwaidhi,2013,p. 26).“The IDF has placed Saudi Arabia to be amongst the top 10 nations worldwide with the highest estimated prevalence of diabetes in 2011 (19.6%) and 2030 (22.3%)” (Quwaidhi,2013’p.16). As stated by Quwaidhi (2013), promoting healthy diet and physical activity could be of greater assistance in dealing with T2DM. The report of World Health Organisation (WHO, 2013) highlighted that 1 out of 10 adults is suffering from diabetes disorder; however, in KSA, the percentage is one out of four adults (Al-Kayyal et al., 2013).

1.2 Research Background

The frequency of T2DM rised rapidly in the Middle Eastver the last three decades. Obesity whichis one of the factors that increase the risk of T2DM, reached endemic ratios in the many Middle Eastern countries. The IDF (2012) informs that the occurrence of T2DM in Saudi Arabia for both genders in 2012 was around 23.38%. Physical inactivity, unhealthy food consumption, and progressively more sedentary lifestyles have been attributed to increases in T2DM amongst Saudi dpeople; for instance, people now prefer use of vehicles instead of walking and are likely to start meetings and conferences with unhealthy foods. Obesity and being overweight are the main determinants influencing the inception of T2DM. In their study Al-Hyas (2011) highlighted that the management of T2DM is categorised poor in gulf countries. Alharbi et al. (2014) emphasised that urgent intervention; for example, the execution of prevention, healthcare promotion, and increased and enhanced T2DM management system, is needed for the Saudi country as a whole.

T2DM becomes the most common chronic disorder in KSA, and the impact it has on society cannot be overlooked. The associated shift in standard of living to more inactive movement with diets which are higher in fats enhances likelihood of obesity which in turn increases risk of T2DM. Daousi et al. (2006) stated that an increased prevalence of obesity in diabetes is notable in the United Kingdom also, with 80% to 90% of individuals diagnosed with T2DM diabetes being obese .

Both males and females in Saudi Arabia are affected by diabetes, but prevalence is comparatively higher in men of age <60 years to that of women of the same age. T2DM has significant influence on quality of life. It has a serious effect of a patient's subjective view of physical, psychological, and social comfort, including both a cognitive and psychological component. According to the report of the WHO, Saudi Arabia has the seventh highest prevalence of diabetes worldwide. Khalid et al. (2017) reported that around seven million of the population in KSA is suffering from diabetes, and about 3 million are pre-diabetic. T2DM is referred to as "a blend of insulin resistance and lessened discharge of insulin." (Cavaghan, Ehrmann, & Polonsky, 2000). Insulin resistance is assumed to be related with low levels of physical activity and obesity. Akala and El-Saharty (2006) have reported that the Middle East region goes through a double affliction of the disorder on account of decreasing ratios of communicable diseases and the increasing ratios of non-communicable disorders. This is termed double affliction because communicable diseases have been controlled however there has been a failure to control the non-communicable diseases (T2DM) which is increasing. Fareed et al., (2010) emphasised the strong relationship between T2DM and maternal history of diabetes, education, physical inactivity, and nutritional intake. Research by Manal et al. (2014) confirmed that T2DM cases were more likely to be chain smokers and hypertensive and obese. Chandramohan (2015) suggested that food consumption (unhealthy food intake) and physical inactivity causes a greater risk to a person getting T2DM. As proper feeding habits help in adjusting for age and family history on T2DM.

In addition to the individual and interpersonal toll, T2DM creates a large burden on public and healthcare systems. According to Ekoe et al. (2001), the disorder is related with critical complications; for example, blindness, and chronic renal failure which have a negative effect on wellbeing and productivity. The risk

levels among the population of KSA have as well been projected to be amongst the highest across the world (Finucane et al., 2011).

Due to the fast economic development, increased urbanization and transformation in overall life style, the prevalence of diabetes is taking place in the Middle East and increasing (IDF, 2015).According to theMinistry of Healh,(MoH) (2015), 4660 patients visited the family heath care centres in KSA.This increasing of T2DM is taking place on account of various causes, including an increasing obesity level amongst people and an ageing population (Kearns, 2007). Patients with T2DM, generally, are subjected to other associated chronic disorders, many of which present with serious complications. Individuals with T2DM have a higher likelihood of suffering from cardiovascular disease compared to the general population (Roper et al., 2002). Worldwide, diabetes represented 11% of the overall health care costs during 2011; Naeem (2015) emphasised that, in KSA, the yearly cost of diabetes has been reached at around $0.87 billion (Alotaibi et al., 2017). According to Tesfaye et al. (2005), the coexistence of hypertension and T2DM is considered as the most important risk factors to the growth and advancement of macro and micro vascular issues in individuals with diabetes compared to the normal human beings. El-Atat et al. (2004) specified that T2DM with hypertension might intensify the possibilities of cardiovascular disease, nephropathy and loss of vision. When hypertension coexists with T2DM, the possibility of cardiovascular disease is intensified by 75%, which additionally playing a significant role in the overall morbidity and mortality of an already exposed population.

Over the past three decades; the health care services has improved considerably.This era started to be economically rich for the nation, owing to the socioeconomic development resulting in a growth in the production of reserves, particularly oil and gas. It brought unwelcome transformations in the complete standard of living and, at large, people moved to urban areas. Long-established dietary practices have vanished rapidly, and inactive lifestyle has crept into the culture. Besides its effect on individuals, T2DM poses a serious burden on health care services and the society on the whole. Aljabri et al. (2018) reported that management of T2DM in Primary Health Care Clinics (PHCC) centres is influenced by the lack of resources and services.

Although hereditary factors play a significant role in T2DM, influences of modernisation have made significant contributions to increases in prevalence (Steyn, 2004). Such rapid economic development not only brings greater opportunities for developments in infrastructure but also introduces diseases (Steyn, 2004). Various ecological factors increase the rising epidemic of T2DM in the Arab countries, with these similar factors also triggering the current explosive growth in obesity in the Arab regions. Obesity, socioeconomic and demographic factors, food consumption and physical inactivity are found to be the major factors that largely trigger T2DM. Badran and Laher (2012) emphasised that the education levels of people will possibly intensify awareness in terms of T2DM risk factors, practices and management, and, particularly, lifestyle scales.

There is little research focusing on the awareness, attitudes and management practices of T2DM in Saudi Arabia among patients and health care providers. Considering the most important socioeconomic transformations, which have taken place in this nation in the last few decades, and their noticeable effect on the standard of living, dietary and physical activities of the population of this country, together with the ageing of the inhabitants, this is a significant omission. This study has consequently been carried out to explore knowledge, attitudes and practises of managing T2DM among men in Saudi Arabia.

1.3 Research Aims

This qualitative study will explore infleunces of T2DM among of male patientsfrom rural and urban areas of Riyadh, Saudi ArabiaKnowledge, attitudes and care practices of health care providers engaged with T2DM patients will be explored and triangulated with data from male patients. Findings from this research will help inform the provision of health care services for male T2DM patients in rural and urban Saudi Arabia. This study recommended a framework for health care providers to enable the assessment of barriers and enablers to self-management of T2DM.

1.4 Research Objectives

i. To explore knowledge and attitudes of male T2DMpatients from KSA about prevention and management of T2DM.
ii. To explore self-care practices among male T2DM patients from KSA
iii. To explore barriers and enablers associated with the management of T2DM identified by male T2DM patients in KSA.
iv. To identify the perceptions of male T2DM patients from KSA on the health care system in the provision of services and the influences of health care providers (physicians and nurses) on patients' decisions regarding T2DM management.
v. To explore health care providers' (physicians and nurses) perceptions of the quality of health services, barriers and facilitators to self-management and how this impact T2DM patients from Urban and Rural health care systems in KSA.
vi. To develop mandunderstand self-management practices among male T2DM patients in KSA to inform health care provision.

1.5 Significance of the Study

This study explored influences of T2DM management among male patients from ruraland urban areas in Riyadh, Saudi Arabia. The study placed specific emphasis on exploring knowledge, attitudes and practices associated with management of T2DM. The study contributes to the limited body of research that has been conducted in the Middle East and other studies conducted in the Gulf Cooperation Council Region (Abdi et al., 2015). This study is unique in that it explores perceptions of rural and urban patients in addition to health care providers working in these areas. While it has been predicted that T2DM is on the increasesin Saudi Arabia and other Middle Eastern countries only a few qualitative studies have been conducted. This study recommended a framework for health care providers to enable the assessment of barriers and enablers associated with self-management of T2DM. The findings will help inform the development of secondary prevention, management and treatment interventions for T2DM in KSA. Additionally, the views of both the patients and the health care providers will provide insights into the

barriers and facilitators experienced when supporting T2DM patients and plan appropriate strategies to address these issues in order to improve health care. Further, sampling of male T2DM patients from rural and urban regions of Riyadh, Saudi Arabia, will enable comparison of the determinants of T2DM (e.g. poor self management, poor diet, and low physical activity) and KAP towards T2DM based on different socioeconomic and environmental status. These data will inform health care practices in urban and rural areas.

1.6 Summary of Chapters

Chapter 1 is the introductory chapter of the proposed study. This Chapter provides an introduction to the research focus and includes: research background, statement of the problem, aims and objectives of the study, research questions, and significance of the study.

Chapter 2 provides a critical review of the literature. The Chapter describes the significance of the problem worldwide, regionally and in Saudi Arabia and explores preventable and non-preventable influences of T2DM. The literature explores research relating to the T2DM and discussed gaps. This chapter also addresses T2DM in Saudi Arabia, the health care provider's perception on level of knowledge of T2DM management in Saudi Arabia, the risk and protective factors of T2DM in Saudi Arabia, and prevention, self management intervention of T2DM in Saudi Arabia

Chapter 3 describes the study methodology. The chapter includes an overview of the research design, research strategy, sampling plan, sampling design, population of the study, data types, data collection methods, interview guide design, data analysis and interpretation techniques that used in this research.

Chapter 4 describes the results of the study. This chapter explores the influences of T2DM management among urban and rural patients and health care providers.

Chapter 5 provides the discussion of the results and makes critical comparisons with other studies. Findings specific to rural and urban patients and health care provided are discussed and compared with other studies. Chapter 6 includes

recommendations and conclusions. This chapter makes recommendations and suggestions based on the results of the research and providing the findings, Strengths and limitations of the study are described.

1.7 Summary

T2DM is a significant health issue worldwide, with prevelance in many countries, including the KSA of concern. This qualitative study aims to explore infleunces of T2DM management among rural and urban patients in Riyadh, KSA. Data collected from T2DM patients will betriangulated with data collected from health care providers in this region.

Chapter 2 Literature Review

2.1 Introduction

The rapid socioeconomic economic development in Saudi Arabia has resulted in lifestyle changes that have ultimately created an epidemic of T2DMin the Kingdom of Saudi Arabia (KSA) (Naeem, 2015; Midhetet al., 2010). According to recent reports, T2DM has reached an all-time high in Saudi Arabia with far-reaching implications in terms of increased risks of cardiovascular diseases, deaths, and reduced productivity (Alotaibi et al. 2017). Khan (2018) states that Saudi Arabia's prevalence rate of diabetes is 18.5 percent, which makes the country among the top ten globally. The World Health Organization (WHO, 2013) concurs and ranks the country second in the Middle East region (Alwin et al., 2017; Ahmed et al., 2018). Apparently, the overall prevalence of diabetes mellitus in the KSA is higher than the global and regional levels (Alramadan et al., 2018).

While different statistics on the prevalence of T2DM in the Kingdom have been provided by different entities, there is a common agreement that the prevalence has reached crisis levels, and hence the need for urgent action to address the problem (Alwin et al., 2017; Khan, 2018; Al-Rubeaan, 2015). A key factor in the trends in T2DM in Saudi Arabia has been the differences in prevalence rates between urban and rural areas. According to a study that reviewed other empirical studies on the prevalence of T2DM in the kingdom, there was a common finding that the disease was more prevalent in the urban areas (25.5 percent) than in the rural areas (19.5 percent) (Alotaibi et al., 2017). Figure 2.1 presents a summary of prevalence rates reported in different studies covering the period between 1995 and 2011.

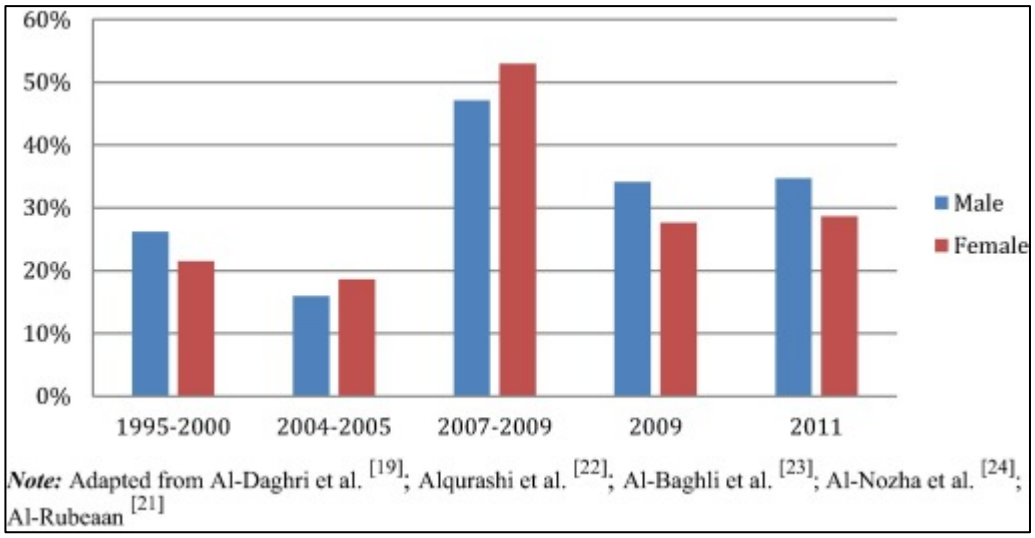


Figure 2.1 Type 2 Diabetes Prevalence in Saudi Arabia, 1995-2011(Alotaibi et al., 2017).

2.1.1 Prevalence of T2DM

T2DM is a disease in which a metabolic system displays hyperglycemia due to impairment of insulin (Khardori, 2015). The disease is considered to be among the most common and devastating chronic diseases in the world as it can stay undiagnosed for a long period and can result in long-term damage to organs such as kidneys, heart and blood vessels, and eyes (Saadia et al., 2009; International Diabetes Federation, 2014). In addition, the disease is viewed as a genetically and environmentally based chronic metabolic and vascular syndrome, and is a major public health challenge that occurs in both developed and developing countries (Acton, 2013). Diabetes increases the risk of developing various debilitating and life-threatening conditions, such as cardiovascular disease, kidney failure, blindness, and amputation of lower limbs (IDF, 2013). The World Health Organization (WHO,2013) indicates that globally, 8.5% of adults aged 18 years and older were diabetic in 2014, with 90% of those diagnosed as diabetics having T2DM (WHO, 2015).Additionally, according to International Diabetes Federation (IDF) in 2014,the estimated deaths' number due to diabetes among adults aged 20-79 years was about 4.9 million (IDF, 2014).

The prevalence rates of T2DM are increasing worldwide, particularly in countries with low and middle incomes where approximately 80% of the people with all-type diabetes currently live (IDF, 2013). Various factors are attributed to the rapid increase in T2DM prevalence, including socio-cultural changes, unhealthy

behaviours, dietary changes, urbanisation, ageing populations, and a significant decline in physical activity (Wu, 2014). As such, the worldwide prevalence of T2DM is estimated to reach approximately 438 million cases by 2030 (Al Bimani, Khan, & David, 2013) and 592 million cases by 2035 (IDF, 2013). Comparatively, the Middle East and North Africa (MENA) region that consists of 21 countries, including Saudi Arabia, has a diabetes mellitus prevalence of 32.8%, which is the highest worldwide (IDF, 2013). Overall, five countries in the region are among the top ten countries with the highest T2DM prevalence worldwide and Saudi Arabia is one of these countries (Al Hayek et al., 2014). The prevalence is a result of major socioeconomic changes in the region, including increased life expectancy. According to the IDF (2014), approximately 362,820 deaths among adults aged 20-79 years in the MENA region were linked to diabetes mellitus in 2014, with more deaths occurring among females than males. Various factors lead to these deaths, including late diagnosis and inadequately equipped health systems. Consequently, the human and economic burden borne by the respective countries is immense.

2.2 T2DM in Saudi Arabia

Saudi Arabia, which refersofficially toKSA, is located in the Arabian Peninsula in Southwest Asia. It had a population of about 27.8 million people in 2013 (CIA, 2015), but this is expected to rise to about 40.5 million people in 2025 (Earth Trends, 2003). The current population of Saudi Arabia is 20.77 million with 3.853 suffering from T2DM (IDF, 2018). Riyadh, the capital of KSA, had a population of about 5.7 million in 2013 (Ar-Riyadh Development Authority, 2014). The 2014-estimated prevalence of diabetes in Saudi Arabia was 32.8%, with over 3.8 million diagnosed and 1.5 million undiagnosed cases among adults aged 20-79 years (IDF, 2014). The prevalence of T2DM among the residence of Saudi Arabia was 32.8 % of the total population. Prevalence was higher among women compared to males (IDF, 2014). According to Badran and Laher (2012), the prevalence of T2DM is highly influenced by the standards of living, with different rates for adults aged 20-79 years in rural (19.5%) and urban (25.5%) regions of the KSA.The study also suggests that the percentage of inactive males in the City of Riyadh is 81% (Badran & Laher,2012). Fasting blood glucose levels for this community-based national epidemiological health survey were classified as diabetic (>7.0mmol/L), impaired fasting glucose (6.1

- 6.9 mmol/L) and normal (less than 6.00mmol/L), using the 1997 American Diabetes Association (ADA) criteria, which was adopted by the WHO in 1998 (Badran&Laher, 2012; Al-Nozha *et al*., 2004). Data on demographic characteristics of the participants and history of diabetes mellitus were collected using a pre-tested and validated questionnaire. Clinical examinations were performed on the participants to collect data on fasting lipids, blood pressure, fasting plasma glucose, height, weight, and waist circumference (Al-Nozha et al., 2004).

Several modifiable and non-modifiable factors are in relation with an increased risk of T2DM in the KSA, including obesity, unhealthy diet, and lack of physical activity, ageing, and family history of diabetes, ethnicity, and gestational diabetes (IDF, 2013). The modifiable factors are largely a result of lifestyle changes, including sedentary living and the influence of western culture. For instance, there is increased availability of energy-dense foods like high-fat foods, sugary snacks, and soft drinks, which is a result of increased urbanization and higher living standards, coupled with a substantial decrease in the energy expenditure levels of individuals and populations (Midhet, Al-Mohaimeed&Sharaf, 2010). As a result, the risk of T2DM incidence in the KSA has increased substantially. However, research demonstrates that up to 80% of T2DM is preventable by adopting a healthy lifestyle, including a balanced diet and regular moderate physical activity (Diabetes UK, 2015; Ades, 2015).

The rate of urbanisation in KSA has increased significantly to represent 83.62% of the population. This rapid urbanisaton has come with sigbnificant health challenges as the increased population is becoming more dependent on pre-prepared foodssold in shops, restaurants and urban markets. The majority of people living in the urban areas are employed and have little time to manage their diet and physical activity. The population in the urban areas is therefore at increased risk of lifestyle-related diseases. According to Reusch, & Manson (2017), the population of the people living in Saudi Arabia have high prevalence of T2DM due to unbalanced diet and lack of physical activity. Another study stated that availability of unhealthy readily available food is impacting diet (Rogers, Kim, Banerjee, and Lee, 2017). Rapid economic economic development, urbanisation and lifestyle change has

resulted in a significant increase of T2DM prevalence throughout the Middle East. A report published by the Saudi Arabian Ministry of Health, found approximately 0.9 million people were diagnosed with diabetes in 1992, but this figure rose to 2.5 million people in 2010, representing a 2.7 increase in the incidence rate in less than two decades. In 2015, 4660 patients with diabetes attended the family and medical clinics across Saudi Arabia (Ministry of Health, 2015). This increasing burden of diabetes is due to various factors, including a rising obesity rate and an aging population (Dee et al., 2014)

2.2.1 Diet and Obesity

Various studies have acknowledged the shifting consumption patterns among Saudis that are mainly facilitated by urbanisation. Al-Othaimeen et al.(2007) suggest that the consumption of natural foods such as dates, wheat, and vegetables that contain high levels of fiber and low levels of both fat and cholesterol has been surpassed by fast foods, including kabsa, French fries, red meat, bakery products and sugary beverages (Midhet et al., 2010). Consequently, many Saudis in urban areas are either overweight or obese, which is linked to an increased reduction in insulin sensitivity (Abuyassin & Laher, 2015). The review by Abuyassin and Laher (2015) documented 40 studies on obesity related T2DM of which 10 studies were conducted in Saudi Arabia. Notably, the study highlights the national epidemiological health study conducted by Al-Nozha et al. (2004) that involved 16,917 males and females aged 30-70 years. The study classified central obesity as waist circumference exceeding 102 cm and 88cm for males and females, respectively. The results showed that 33.1% of males and 27% of females with central obesity were diabetic. Consequently, the study established that the rise in obesity is associated with an increasing prevalence of T2DM, with the prevalence of T2DM twice as likely among obese females with normal waist circumferences. Further, the study indicated that persons with a high Body Mass Index (BMI) are at an increased likelihood of having diabetes or impaired fasting glucose (IFG) (Al-Nozha et al., 2004; Abuyassin&Laher, 2015). High BMI, particularly obesity, is a major concern as it is linked with worsened T2DM prognosis (Abuyassin&Laher, 2015). Memish et al. (2014) reports that the prevalence of obesity among Saudis aged 15 years and older is 28.7%, with a relatively lower prevalence among males (24.1%) compared to

females (32.8%). The multistage survey by the Saudi MoH interviewed 10,735 Saudi's aged 15 years or older and collected information regarding their socio-demographic characteristics, consumption patterns, physical activity, blood pressure levels, diabetes status, and hypercholesterolemia. The study reported that a majority of Saudi's consume low quantities of vegetables and fruits and participate in low to no physical activity (Memish et al., 2014).

2.2.2 Physical Activity

High BMI, Impaired Glucose Tolerance (IGT) and the subsequent T2DM are modifiable through healthy diet and increased participation in physical activity (IDF, 2013). However, studies indicate that the majority of Saudi Arabian citizens are not involved in regular moderate physical activity (Memish et al., 2014). A majority of urban dwellers have adopted sedentary lifestyles that stem from rapid developments and technological advancements. There are limited green spaces for children to play while cars are used even over short distances. Additionally, elevators and escalators are used in buildings and shopping centers, which has contributed to the issue of inadequate physical activity. A review by Badran and Laher (2012) reported that 81% of adult males in Riyadh are physically inactive while a case control study by Midhet et al. (2010) affirmed that insufficient physical activity and poor nutrition increases the risk of T2DM among Saudi men (Midhet et al., 2010). The national survey by Al-Zalabani, Al-Hamdan and Saeed (2015) involved 4758 participants aged 15-64 years and assessed physical activity using the Global Physical Activity Questionnaire (GPAQ) while utilizing the WHO recommended STEP wise approach to Surveillance (STEPS).According to the study's findings, 66.6% of Saudis were physically inactive, with the prevalence being higher for females (72.9%) than males (60.1%). The study notes that the low physical activity levels observed among females is due to socio-cultural factors, for instance, the Saudi culture restricts women from undertaking physical activities in public, particularly in rural areas where even walking-for-fitness is unacceptable (Al-Zalabani et al., 2015). In addition, the study linked higher levels of physical inactivity to the socioeconomic status of individuals, with employed individuals having higher levels of physical activity than homemakers, unemployed, and retired individuals. Further, as noted by Abuyassin and Laher (2015), the climate of Saudi Arabia that is mainly hot and dusty

impedes outdoor physical activity. Due to cultural barriers in the Middle East and North Africa, women have a limited access to sporting/exercise facilities. In Saudi Arabia 99.5% of adult female in Asir Province participated in no exercise of any intensity (Badran&Khan, 2012). Due to sedentary practices, coupled with the intake of high dietary energy, there is a substantial increase in exposure to the risk factors for T2DM incidence, including overweight and obesity (Al-Nozha et al., 2007). Importantly, the lack of adequate physical activity among individuals with T2DM hinders effective management of the disease through appropriate self-care practices.

2.2.3 Ageing

The levels of physical activity are dependent on the age of individuals as indicated by contrasting results of studies using different age categories. In contrast to the findings by Al-Zalabani et al. (2015) who assessed Saudis in the age category 15-64 years, a population-based cross-sectional study by Al-Nozha et al. (2007) involving 17,395 Saudis aged 30-70 years found that 96.1% of Saudis (males 93.9%; females 98.1%) were physically inactive. The findings are indicative that the prevalence of physical inactivity increases with advancing age. In particular, the level of inactivity significantly increases with age among males (Al-Nozha et al., 2007). Badran and Laher (2012) assert that adults aged over 45 years are more at risk of T2DM while the IDF (2013) report that persons aged 40-59 years comprises almost half of adults with diabetes. Different studies have demonstrated a higher incidence of diabetes among older compared to younger persons. The study by Al-Nozha et al. (2004) showed a proportional increase in T2DM with age: 30-39 years (12.1%), 40-49 years (23%), 50-59 years (33.8%), and 60-70 years (36.5%). Similarly, a nationwide population-based cross sectional study by Al-Rubeaan et al. (2014) assessed the fasting blood glucose levels among 18,034 Saudis aged 30 years and older. The findings indicated a positive association between age and the prevalence of both T2DM (30-44 years 14.7%; 45-64 years 37.5%; 65 years and older 45.7%) and IFG (30-44 years 24.3%; 45-64 years 26.6%; 65 years and older 29.5%). The study inferred that there is a 10% increase in diabetes prevalence as age increases by 10 years and the prevalence peaks at 65 years (Rubeaan et al., 2014). Additionally, the study established that the overall prevalence of T2DM among

Saudi adults aged 30 years and older is 27.35% and significantly differs between males (32.8%) and females (21.9%).

2.2.4 Family History of Diabetes

A retrospective case-control study by Midhet et al. (2010) involving 286 T2DM patients (cases) and 291 non-diabetic persons (controls) evaluated the association between diet and physical activity and T2DM risk among male and female Saudi's aged 30-70 years in the Al-Qassim region. The findings revealed significant information concerning the onset of diabetes. At least one-third of the T2DM cases were diagnosed when the patients were over 40 years of age. On average, males were aged 46 years and females 42 years at onset. Importantly, the study outlined delays in screening for T2DM as some patients were only diagnosed after experiencing vision problems. In addition, the study emphasised the significance of a family history of diabetes and showed that the cases were more likely than the controls to have a maternal history of diabetes and a sibling with T2DM.Specifically, patients whose mothers had diabetes were diagnosed at a younger age than those whose mothers had no diabetes. The family history of diabetes is an important predictor of T2DM incidence and some studies attribute the increased prevalence of T2DM to consanguine marriages (Midhet et al., 2012). In their review, Badran and Laher (2012)notes that consanguineous marriages are positively associated with T2DM and could be influential in Saudi Arabia where 80% of persons in consanguineous marriages which had at least one family member had a history of T2DM as compared to 20% of persons in non-consanguineous marriages. The offspring of consanguineous marriages with a family history of diabetes in the family are genetically predisposed to insulin impairment. However, the study by Midhet et al.(2010) found no substantial effect of consanguinity on the risk of diabetes. While having a mother with diabetes increased a patient's risk of T2DM, there was no significant effect on risk if the father or other maternal and paternal relatives had diabetes.

2.2.5 Socio-economic Status

The influence of socioeconomic status on diabetes prevalence is illustrated by a cross sectional study conducted by Parajuli et al. (2014). The study identified factors that lead to non-adherence tophysical activity and diet among 385 Nepalese T2DM patients. The study reported that adherence to physical activity is highly influenced by socioeconomic status, with upper middle class individuals having a higher level of adherence than those in the lower middle class. Additionally, the study showed that adherence to dietary advice is higher among persons in upper middle class than those in lower socioeconomic classes. Further, Parajuli et al. (2014) indicated significant differences in adherence to physical activity between persons living in rural and urban regions, with higher levels of adherence among the rural than urban dwellers. While the results pertain to Nepal, they could explain the higher prevalence of T2DM in urban than rural regions in the KSA as indicated by Badran and Laher (2012). In contrast, persons of low socioeconomic status in the rural areas are involved in physically intensive occupations that offset their physical activity requirement. Regarding diet, persons in high socioeconomic statuses in urban areas have increased access to less-healthy foods, which is brought for sale in the markets in large variety as compared to those in the rural areas where they could only access what they grow. In particular, eating out is a common practice in the urban areas due to the high earnings and increased accessibility to fast foods, which are high in calories, fat and salt (Midhet et al., 2010).

Considering that genetic and behavioral factors (diet and physical activity) are the main contributors of T2DM, moreover, “it is equally important to address the impact of physical and social environments, which may include low income, employment insecurity, low educational attainment, and poor living conditions, on health outcomes” (Hill et al., 2013). In Saudi Arabia, research by Al Hayek et al. (2014) on the factors that influence the health-related quality of life (HRQOL) of Saudi T2DM patients established that the HRQOL is significantly lower for low-income T2DM patients than medium- and high-income T2DM patients. The study sampled 283 T2DM patients in tertiary care hospital in Riyadh, Saudi Arabia. The study concluded that the economic status of T2DM patients is a risk factor for most HRQOL subscales, including physical activity, general health, and social and

emotional health. As this study highlighted, low income affected the health outcomes of T2DM Saudi male patients by either increasing their chances of consuming unhealthy foods and/or limiting access to regular physical exercise through membership in fitness clubs or low self-management activities, such as glycemic control (Tang et al., 2003).These results are consistent with those obtained from a case-control study on the risk factors of T2DM by Murad et al. (2014) involving 159 cases (diabetic patients) and 129 controls (non-diabetic Saudis) in Jeddah, KSA. In the sudy, diabetes was established as fasting blood glucose ≥126mgdL.The findings of the study founda higher likelihood of diabetes among individuals with low annual incomes (total salary < 7000 Saudi Riyals; Unadjusted OR = 3.38, 95% CI 1.42 to 8.06) and low education achievement (illiterate or completed primary school).In conclusion, Murad et al. (2014) suggests a need to identify and counsel people at high risk of developing diabetes son self-care and self-management practices. Mainly, this will necessitate the determination of the uncontrollable risk factors such as socioeconomic status, gender, age and other environmental factors, and the controllable risk factors, including smoking, obesity, dyslipidemia and hypertension (Murad et al., 2014).

2.3 Health Care Providers' Perception of T2DM in Saudi Arabia

Health is a critical part of development in the KSA, and it has consistently been included in all national 5-year plans since 1970 (WHO, 2013). The Saudi MoH facilitates the provision of health care services by funding a major proportion of the hospitals(62%), clinics and health centers (53%) in the Kingdom (Royal Embassy of Saudi Arabia, 2015).Additionally, the MOH supervises and supports the functions and staff training in privately owned hospitals. Various government bodies account for 19.3% of the health services provided in the KSA, including the Armed Forces, the National Guard, Security Forces, ARAMCO, and the Royal Commission for Jubail and Yanbu (Almaki et al., 2011). These mainly provide health services to employees and their families, but also handle medical emergencies for all residents. In addition, the Red Crescent Society, teaching hospitals, school health units and referral hospitals, such as the King Faisal Specialist Hospital, form a crucial part of the health system. Further, the private sector, which currently operates 130 hospitals in major cities and large towns (Al-Kelya& Al-Saggabi, 2013), caters for 21.2% of

the health services in Saudi Arabia (Almaki et al., 2011).Currently, the health sector employs 34,000 physicians, with 20% being Saudi nationals and the remainder non-Saudi nationals (Royal Embassy of Saudi Arabia, 2015). This poses is a challenge in terms of maintaining a stable workforce and increasing the efficiency of health care services. In particular, the treatment of diabetes complications can be a major hurdle to the Saudi government due to increased expenditure that accounted for about 6.5% of the 2010national budget (Alhowaish, 2013). Thus, awareness programs, nationwide screening campaigns, and health education programs are needed to reduce diabetes and the resultant health complications, which will also lead to a substantial reduction of the economic burden in the long term (Alhowaish, 2013). Alhowaish (2013) posits that the health care providers in KSA should adopt the system of health account (SHA) in conducting cost-of-illness studies. In using the SHA approach, the providers will have adequate knowledge on the cost of diabetes and an understanding of the importance of diabetes prevention, and this will facilitate effective management strategies.

The communication between the Health Care Providers (HCPs) and the patient is crucial to delivering patient-centered care. However, a majority of the workforce in health services comprise foreign personnel (Almaki et al., 2011; Royal Embassy of Saudi Arabia, 2015), with little or no knowledge of the local dialect since some were from foreign Nationals, traditions, health-related beliefs, and culture (Elzubier, 2002). Thus, they have different ways of receiving patients, which influences how the patients explain their reasons for seeking consultation, including their symptoms, feelings, thoughts, and expectations. Efficient communication between physicians and patients enhances self-reliance in the management of T2DM by eliminating misconceptions about the disease. In this context, Elzubier (2002) outlines some of the ways that physicians can improve their communication with patients, for instance, ensuring that the treatments match patients' preferences, and evaluating patients' understanding of the physician's instructions. In addition, physicians should anticipate intentional and unintentional compliance problems and should write down the treatment plans for the patients to remember or provide written materials, such as leaflets and booklets. Unintentional non-compliance is a major drawback among diabetics due to poor communication that interferes with the efficacy of the pharmacological interventions, such as insulin, aspirin, and oral hyperglycemic drugs

(Asiri, 2015) and adherence to follow-up. Thus, improving patient satisfaction and clinical outcomes necessitates that health providers are educated right from the onset of their medical studies by incorporating communication skills in the curricula (Elzubier, 2002). This should be supported by continuous education to practicing physicians though workshops and seminars on patient-centered care.

In the Saudi health care system, nurses in the primary health care centers (PHCs) provide care to patients and handle other administrative roles, which, besides having inadequate materials, make it difficult to educate patients (Asiri, 2015). Educating patients is mainly the role of physicians but is ineffective as it is mainly verbal and offered during consultations. Health care providers need to be well equipped in health service management to facilitate effective T2DM management (Khan et al., 2011). In particular, they require skills for promoting physical activity, and dietary modifications among T2DM patients. Diabetes complications affect various body systems simultaneously and may lead to loss of eyesight, amputation, kidney failure or cardiac failure (Al-Nozha et al., 2004). The health care providers should have adequate knowledge on diabetes diagnosis using fasting plasma glucose as specified by the American Diabetes Association (ADA) and screening to enable earlier detection and timely intervention among individuals, and to increase patient awareness of T2DM. Evidently, health promotion among diabetics is fundamental and physicians are at the core of leading the call to action against T2DM. Their knowledge, attitudes and practices (KAPs) are, therefore, significant predictors of self-reliance and better management among diabetics. (Al-Nozha et al., 2004)

Khan et al. (2011) conducted a KAP survey on 122 physicians involved with T2DM patients in Al Hasa region, KSA. The KAPs of the physicians were evaluated using a 62-item questionnaire that included four sections assessing demographic and professional information (12 items), knowledge (23 items), attitudes (15 items), and practices (12 items).A majority of the KAP items were measured using a five-point Likert scale and each question had a weight of 2 points. Among the 99 physicians that provided usable survey information, the mean KAP was 66.59%. The KAP was lower for female (64.7%) than male physicians (66.9%) but higher for rural (68.7%) compared to urban physicians (65.3%). The KAP was also higher among non-Saudi physicians (67.4%) than Saudi physicians (62.5%) and declined across the years of

experience of the physicians (1-5 years 70.16%; 6-10 years 66.52%; 11-20 years 62.7%; over 20 years 60.7%). Importantly, the practices (measured out of 24) were significantly higher for physicians who had clinical practice guidelines (CPG) in their clinics (20.5) than those without the CPG (16.5). The CPG is a manual prepared based on the guidelines of the ADA by the Saudi MOH that outlines the appropriate care for diabetics. Using the CPG is expected to reduce variations in T2DM management between physicians (Khan et al., 2011). The physicians surveyed in Khan et al. (2011) identified oral hypoglycemics, lifestyle modifications and a combination of lifestyle modifications and Metformin as the appropriate treatments for newly diagnosed T2DM patients. They also identified that T2DM patients should participate in moderate aerobic exercise for at least 150 minutes per week. Most of the physicians affirmed that primary prevention of diabetes is the best suited strategy to curtail its prevalence. Among the practices that the HCPsusually followed included blood pressure checks, lipid profile, eye and foot exam, serum creatinine, and urinary protein. However, Khan et al. (2011) suggests that the KAPs of Physicians, particularly regarding diagnosis, self-management education, treatment, and adherence to CPGs, need to be improved through awareness and education programs.

These results are affirmed by Al Wadaani (2013) in a cross-sectional survey of the KAPs of 96 sixth-year medical students studying at King Faisal Medical University College in Al Hasa, Saudi Arabia. The KAPs of the medical students were measured using a 22-item questionnaire consisting of four sections, including demographic information (four items), knowledge (10 items), attitudes towards diabetes mellitus and retinopathy (five items), and practices (three items). The knowledge and practice items were open-ended and each correct response was awarded 5 points while the practice items were measured on a five-point Likert scale, with each correct response awarded 25 points. The students had a KAP score of 64.8%, with males (65.3%) having a significantly higher KAP score than female students (64.2), $p = .02$. Overall, the students had a knowledge score of 34.9 (out of 50), attitude score of 16.6 (out of 25) and practice score of 13.19 (out of 25). Importantly, the students indicated that diabetics have a high likelihood of retinopathy 20 years after diagnosis, and pointed out that ophthalmologists should regularly examine the patients to detect retinopathy. The study notes that early

detection helps to delay diabetes complications and that there exists a lapse in the training of physicians as the KAPs of the medical students were substantially lower than expected. Thus, in concord with Elzubier (2002) who suggested adjustments to the curricula to include communication skills, Al Wadaani (2013) points out that the training of medical students should be restructured to emphasise diabetes screening and management.

As indicated by Khan et al. (2011), the adherence to CPGs by physicians is still below acceptable standards and disparities are evident in the management and treatment of T2DM among Saudi patients by physicians. A study investigating the predictors of the practices of physicians in relation to nutritional counseling and management among 266 physicians working in various hospitals in Riyadh city found very few physicians practice nutritional counselling and management (Al Muammar, 2012). The study attributed this to lack of confidence by the physicians which fails to reinforce the patients' beliefs in their capabilities (Aljoudi&Taha, 2009). Additionally, research by Al-Elq (2009) focusing on the practices of T2DM Saudi patients asserts that while around 94% of Saudi T2DM patients have health care coverage, less than 50% of them were evaluated for the levels of glycemic control due to low level of self-management training programs. Hence, the results of the study indicated an underestimation of the importance of diabetes education, which necessitates that both the patients and health care providers are educated on the effective management of diabetes. This study wasconducted among 353 Saudi T2DM patients and 28 physicians. Although the study by Al-Elq (2009) did not determine the exact cause of non-adherence to diabetes services, and did not test the compliance of patients to regular screening; it concluded that health education programs are necessary to increase adherence to standard practice among physicians, and to enlighten the T2DM patients on the need for screening for complications and controlling the risk factors.

The level of physician-patient interaction is critical in positively influencing the patients' KAPs and T2DM self-care and self-management through increased compliance to medication, follow-ups and lifestyle modifications (Kirk et al., 2015). In a study among 535 diabetes patients (n = 468; male = 41.2%; female = 58.8%) in rural (Omran) and urban regions (Mobarraz and Faisaliya) of Al Hasa district, KSA, Khan et al. (2012) assessed the factors that influence non-compliance.

Noncompliance among patients who had been prescribed medication and offered advice on self-care was measured as HbA1c > 7%. The factors related to non-compliance were identified as patient-related, therapeutic, and health care system issues. Noncompliance to therapy was reported as 67.9% (males 69.34%; females 65.45%) and was significantly higher among urban (71.04%) than rural participants (60.15%). Importantly, the findings indicated that noncompliance decreases with the level of education. However, in contrast to the study by Parajuli et al. (2014), Khan et al. (2012) found no association between age and noncompliance. In this regard, Khan et al. (2012) asserts that having supportive physicians who listen to the patients keenly and supply important information increases compliance.

The KAPs of the health care providers are important in enhancing the provision of education for effective T2DM management among the patients. Physicians need to provide patient-centered care that caters for the needs and expectations of the T2DM patients and facilitate health education through efficient communication with the patients (Elzubier, 2002). Health education is the key to managing T2DM as it enlightens individuals about their general health conditions, the health conditions of the persons they care about, and instigates the adoption of healthy behaviours and utilization of available health care resources in the population (Alnaif&Alghanim, 2009). Besides providing patients with information about T2DM and the available treatments, proper health education needs to be delivered using the appropriate methods and approaches to be effective, and needs to have indicators for monitoring and evaluating its effectiveness. Consequently, effective health education will impact the patients' KAPs, which are a major risk factor of T2DM in the KSA.Further, the input of pharmacists in T2DM management is pertinent as they can assist physicians to detect drug interactions, complications, and compliance, which facilitates effective medication. However, despite improving adherence to medication and contributing to enhanced knowledge for glycemic control and blood pressure, pharmacists cannot substitute the direct care offered by physicians to T2DM patients. As such, the provision of optimal care to diabetics is a partnership between various health care providers (Alhabib et al., 2014).

2.4 Risk and Protective Factors of T2DM in Saudi Arabia

2.4.1 KAPs of T2DM Patients

There is low awareness and knowledge about T2DM symptoms and risk factors among Saudi patients. Aljoudi and Taha (2009) conducted a cross-sectional study among 300 Saudi adults aged 18 and over who attended the Aqrabya Primary Care Centre, the largest centre in Al-Khobar which is located in the Eastern Province ofSaudi Arabia. In this study, more than half of the participants were not able to mention any diabetes mellitus risk factors or preventive measures correctly (Aljoudi&Taha, 2009). In another study, Saadia et al (2009) conducted a cross sectional study among 570 female patients who attended the Mother and Child Hospital and Qassim University Clinic in Buraydah, KSA, to assess their KAP. The KAPs of the patients were measured using a 25-item questionnaire (knowledge = 18 items, attitudes = four items, and practices = three items) and each correct response was awarded one point. Results revealed good knowledge but poor attitude and practices toward diabetes. The results of the study showed that the knowledge score was 12.42±3.034 (with the maximum possible score of 14); while attitude and practice score were 1.46±1.79 and 2.79±2.28, respectively (with the maximum possible scores of 5 and 6, respectively) (Saadia et al., 2009).

Knowledge is likely to influence physical activity and normal eating habits that play an important role in T2DM (Saleh et al., 2012).Al-Amoudi and Alrasheedi (2013) conducted a cross-sectional study among 107 T2DM female schoolteachers in Jeddah, a western province of Saudi Arabia. The results of the study showed that the daily food intake (e.g. the number of meals consumed) was not enough for 37% of the participants. Moreover, the results showed that they had inadequate knowledge about food eating habits and macronutrient content. In particular, the participants wrongly understood that carbohydrates and sugars are helpful in lowering blood glucose. The study also found 42% of the participants were inactive (based on the type and duration of their daily or weekly physical activity), and those who were active (was measured as 30 minutes of moderate physical activity most days/week) did not spend enough time exercising each week(Al-Amoudi&Alrasheedi, 2013).

Low levels of knowledge, attitude, and practice among T2DM patients negatively affect the patients' attitudes and management practices (Aljoudi&Taha,

2009). For instance, Khan and Khan (2000) conducted a cross-sectional study on 342 Saudi diabetic patients registered in diabetic medical clinic at the Najran General Hospital, KSA. The results of the study showed that almost half of the participants did not have adequate knowledge about the symptoms of hypoglycaemia. The results also pointed out that knowledge about the chronic complications of diabetes was very low (15%). However, all patients who were admitted to the hospital in KSA received routine education about diabetes and the results showed very low self-testing of urine and blood at home (6%) (Khan & Khan, 2000). The level of knowledge about the disease and the level of compliance to medication have been also evaluated among the Saudi population. In a similar study, Abahussain and El-Zubier (2005) conducted a study among 91 female diabetic school teachers working in the sector of girls' education in Al-Khobar which is located in Eastern Province of Saudi Arabia. While 52.7% of the participants were compliant with hypoglycaemic, insulin, and insulin and diet medication, only 5.5% were compliant with physical activity. Notably, the patients were less knowledgeable about diabetes medication and most of them were using herbsto manage diabetes, including Habbalah and Swadda, Saber, fresh garlic, aloe vera, and fresh onions(Abahussain& El-Zubier, 2005).The patients' knowledge about hypoglycaemia was lacking, which hinders their ability to cope with diabetes complications effectively. Importantly, consistent with the findings of Alhabib, Aldraimly and Alfarhan (2014), the study by Abahussain and El-Zubier (2005) highlights the important role of pharmacists in advising patients about drug-herb interactions. Further, the importance of increased patient awareness through health education is emphasized to enable self-monitoring of blood glucose and long-term glycaemic control.

Khan et al. (2015) conducted a cross sectional study with 213 male T2DM patients aged 18 years to 80 years in Aseer Diabetic Centre (ADC), Saudi Arabia. Using measurements for glycayted hemoglobin (HbA1c), the glycaemic levels of the patients were assessed as good (6-6.9%), acceptable (7-7.9%), poor (8-8.9%) and extremely inadequate (at least 10%). The attitudes of patients were obtained from medical records at ADC. Similar to Aljohani (2011), the study found that self-monitoring to control the blood glucose and adherence to the recommended diet was low as reported among 39.52% and 34.63% of the patients, respectively. In addition,68.79% of patients reported physical activity, which included 30-minute

walks that conform to the 30 minutes of moderate-intensity activity daily as established by the WHO (2015). Compliance to therapy was 50.25% and the glycaemic levels were substantially lower after9 months (8.99±1.70%) compared to baseline (9.52±2.06%). Only 15.12% of the patients were aware of the type of diabetes they had while 35.12% were knowledgeable about the disease aetiology (Khan et al., 2015).The majority of the patients reported that forgetfulness is the primary cause on noncompliance to oral medications. The study indicates a low level of KAPs among patients and suggests that health care providers should adopt various strategies for health education to enhance the efficacy of caregivers and KAPs of diabetics, for instance, group sessions. A majority of the studies on the KAPs of patients indicate low levels of awareness due to a lack of effective health education (Elzubier, 2002; Al-Elq, 2009; Asiri, 2015; Khan et al., 2015). Sabra et al. (2010) assessed the misconceptions about T2DM among 1030 male attendees aged 15 years and older at eight PHCs in Eastern Saudi Arabia. Patients with T2DM comprised 11.7% of the sample. Misconceptions were measured on both the aetiology of T2DM and the general concepts. The findings indicated that most of the participants wrongly believed that diabetes is inherited (64.8%), diabetes results from high sugar consumption (65.9%), the efficacy of oral hypoglycaemicis higher than that of insulin (28.8%), and herbs are effective in T2DM management, including black seed (51.8%), garlic (48%) and onions (34.2%) (Sabra et al., 2010; Abahussain& El-Zubier, 2005). The misconceptions were substantially related to education level, with higher misconception levels among illiterate attendees than the literate; and income level, with higher misconception levels among attendees from low-income families than attendees from high-income families. Notably, 57.6% of the attendees identified television as the primary source of diabetes information, 55.1% and 54.7% indicated friends and family members as main sources. Inevitably, the study underlines the need for education of diabetics regarding medication and nutrition.

Similarly, Alsuni et al. (2014) studied diabetes misconceptions of 200patientsenrolled at a hospital providing the tertiary care in Eastern Province of the KSA. The study's questionnaire was designed based on the Brief Illness Perception Questionnaire (Brief IPQ) and Belief about Medicines Questionnaire (BMQ). It contained 36 items measuring the patient's misconceptions, with possible scores categorized as low (0-12), moderate (13-24) and high (24-36). Patients with type-I

diabetes comprised 39% and those with T2DM, 61% of the sample. The time since diagnosis was <5 years for 36.5% of the patients and 6-10 years for 36% of the patients. About 52.5% of the patients were taking insulin, 47.5% were taking oral hypoglycaemic, 62% were self-monitoring their blood glucose, and 56% were practicing diet control. While83.5% had received diabetes health education, the overall average misconception score was low among the patients (10.29±4.92). The most common misconceptions included the beliefs that being overweight leads to diabetes (89%), diabetes is only hereditary (80.5%), diabetes results from consuming too much sugar (69%), diabetes treatment does not prevent complications (89%) and medicines should not be taken when blood glucose is normal (66.5%). The misconceptions were significantly attributed to female gender, rural areas, illiteracy(Sabra et al., 2010), time since diagnosis, and lack of diabetes education. Thus, the study posits that the knowledge of these factors can help to streamline awareness programs to provide better education on diabetes care.

Furthermore, Thabit (2013) conducted a study to measure the influence of the KAPs on the personal management among 145 Iraqi T2DM patients aged 30 years and older in three public medical centres (Al-Baladiat, Mustansyria, and Zuafaran). The study notes that the patients' awareness, attitudes and practices towards T2DM are pertinent in ensuring effective management through early detection and management of T2DM and hypertension. According to the study's findings, 47.6% of the patients were aware of retinopathy, 52.4% had a glucometer, 70.5% affirmed that lifestyle modification is the first self-management step, and 46.8% of the patients had knowledge of the appropriate drugs, their dosage, and their side effects. However, the patients had less knowledge regarding myocardial infarction (18.6%), only 11.03% monitored their blood glucose daily, and only 40% indicated that weight reduction facilitates T2DM management. The study concludes that the patients have poor awareness (49.7%) of T2DM and its complications. Also, the effective management of T2DM can be achieved by educating patients on self-care and motivating them to change their attitudes towards adopting self-management practices of T2DM complications. In particular, lifestyle modification should be emphasized, including increased engagement in regular physical activity and intake of good nutrition (Sharaf et al., 2012). Importantly, Thabit (2013) recommends a synergy between health care providers to improve T2DM awareness by establishing

a feasible education program and emphasizing self-care. The patient education programmes should highlight various aspects of the disease, including aetiology, ideal weight, blood pressure and glucose measurements, complications, lifestyle modifications, compliance to medication, and adherence to follow-up (Thabit, 2013; Kirk et al., 2015).

2.4.2 Setting, Culture, and Religion

Saudi Arabia is located in a region with a hot desert climate that provides a harsh environment for physical activity (Abuyassin&Laher (2015). The country's culture is mainly anchoredon Islam and its legal and political systems are all based on Islamic principles. Over the years, a major transition has occurred in the Saudi culture, mainly in regard to food consumption habits due to urbanization (Midhet et al., 2010). Traditionally, the staple foods, which were mainly eaten at home, included dates, milk, bread, pumpkin, okra, vegetables, and occasional mutton, goat or camel meat, or fish. However, in contemporary society, dates, whole grains and milk are rare and meals mainly consist of rice and chicken. Meals are taken late and restaurants that serve various fast foods from different parts of the world are widespread in Saudi Arabia. Despite the cultural transition, traditional practices involving consumption of rice and meat between rounds of tea and coffee, particularly during social occasions such as weddings, feasts, and family reunions, are unwavering. In addition. Saudis conduct ritual celebrations of Ramadan and the subsequent Eid al-Fitr, and the holy pilgrimage to Mecca (Hajj) and the subsequent Eid al-Adha (Cole, n.d.). Further, men and women are accorded different roles and statusesin theSaudi society. All these factors have substantial influences on the overall health outcomes, particularly concerning chronic diseases.

The settings in which people live can also inform the health care providers' KAPs about the disease they treat. For example, Khan et al (2011) conducted a cross-sectional survey to assess the KAP of 122 Physicians working in the Al Hasa district in Saudi Arabia. The results revealed that the rural physicians scored higher KAPs (68.7%±10.2%) than the urban physicians (65.3%±7.4%)(Khan et al., 2011). The result of the study showed the importance and need to improve the knowledge, practice and attitude of treating T2DM patients. Additionally, previous studies in KSA revealed that T2DM has exceedingly high rates in urban areas compared with

rural areas (25.5% vs. 19.5%) (Alzaid, 1997; Al-Nozha et al., 2004). Guize et al. (2008) asserts that the poor management of T2DM among patients in rural areas is as a result of limited access to the health care system, quality of care, services usage, financial obstacles (Bell et al., 2010), geographical barriers, patient perception and lack of knowledge of diabetes and diabetes complications such as retinopathy (Wilson, &Eezzuduemhoi, 2005).

Lynch et al. (2011) evaluated the level of diabetes care provided to veterans living in rural and urban areas using a national data set of 10,570 veterans with T2DM in the US. "Veterans included all persons who had served in the regular military, National Guard, or military reserve unit but were currently not in active duty" (Lynch et al., 2011). This study compared quality of care indicatorsand the self-management behaviors between veteran T2DM patients in urban and rural areas. As a result from the comparison between urban and rural veterans, rural' veterans had significantly lower education and less annual income. The results also showed that urban veterans perform blood sugar testing at least one time daily compared with rural residents (Lynch et al., 2011)." These differences in medical care among rural residents with diabetes are related with adverse outcomes such as poorer glycemic control, worse lipid profiles, higher blood pressure"(Andrus et al., 2004). Furthermore, "diabetes-related outcomes are also adversely affected by poor self-management and lifestyle behaviors, including poor diet, low physical activity levels, inadequate self-monitoring of blood glucose and poor medication adherence" (Egede et al. 2005).

Alzubaidi et al. (2015) assessed the barriers and enablers to health care access in a qualitative study involving 60 Arabic- and 40 English-speaking (Caucasian) T2DM patients in Melbourne, Australia. The study found a higher insulin use among Caucasian patients than Arabic-speaking patients and a higher proportion of Caucasians (17.5%) had achieved glycemic control (HbA1c <7 mmol/l) than Arabic-speaking patients (5%). Access to the available medical services was substantially delayed among the Arabic-speaking patients, primarily because of lack of autonomy and the collectivist nature of Arab culture that necessitates the involvement of family members in decision-making (Al Mutair et al., 2014). In particular, the reluctance was higher among male compared to female patients as they believed that medical

services are only suited for emergencies or severe pain or illnesses (Alzubaidi et al., 2015). On the contrary, the Caucasian patients were less hesitant to access medical services and more likely to be screened and diagnosed early before the onset of T2DM. In addition, the Arabic-speaking patients were less likely to adhere to the recommendations by Australian hospital-based health care providers due to prior negative experiences and lack of rapport aggravated by language barrier (Alzubaidi et al., 2015).

Further, the religious beliefs of the Arabic-speaking patients hinders their access to health services, particularly the patients 'belief that Allah determines one's life course and their current predicament is predetermined; thus, they are less motivated to seek medical diagnosis or practice self-management. Albougami (2015) asserts that Muslims believe that Allah dictates health, which did not appear in the study, illness, death, and this interferes with the patients' health-seeking behaviors. Also, Islamic religion dictates that, in culturally sensitive care, a male physician cannot attend to a female patient in the absence of her husband, relative, or a female nurse except in case of an emergency where a female physician is unavailable. Similarly, a Muslim female nurse is not permitted to touch a male patient with the exception of her husband or a family member. When giving food or medication to patients, nurses are required to use their right hand (Al Mutair et al., 2014). Therefore, care needs to be family-centered because the family influence is critical to the patient's health and non-Muslim health care providers need to understand the Saudi Culture. Several studies have shown that culture and religion possibly affect the experience, interpretation and self-management of the disease (Lai et al., 2007). According to the descriptive qualitative study conducted by Lundberg and Thrakul (2012) "among thirty Thai Buddhist men and women diabetes patients living in an urban area of Bangkok found patients who reported a high level of coping often used their religious beliefs, which gave them the meaning and strength to better cope with their disease. Self-care behaviors were influenced by gender, education level, economic status and social support, and by the religious beliefs of older people with diabetes."

Fasting Ramadan (the holy month) is one of the religious practices that may affect the daily life of T2DM patient and possibly causing troubles when not

following the HCP' instructions and advices. "As the optimum management of diabetes is reliant on controlled diet, exercise and possibly medication regimes, fasting during Ramadan could present risks to Muslim persons with diabetes" (Benaji et al., 2006). That is, Muslim persons with diabetes may or may not choose to adhere to their regular diabetes management program during Ramadan regardless of the advice and information they have received (Peterson et al., 2012). The effectiveness of individualized education before Ramadan in patients with diabetes self-management and knowledge was assessed among 774 patients who were from Egypt, Jordan, Iran, and Saudi Arabia (515 as an intervention group and 259 as a control group) (McEwen et al., 2015). Patients in the intervention group were more likely to modify their diabetes treatment plan during Ramadan, to perform self-monitoring of blood glucose at least twice daily during Ramadan, and to have improved knowledge about hypoglycemic signs and symptoms (p=0.0007)(McEwen et al., 2015). Moreover, T2DM patients who were educated individually during month of Ramadan were able to reduce their body mass index in addition toglycayted hemoglobin comparing them to the patients who received usual care (McEwen et al., 2015). "Thus, many more Muslim diabetic patients may require considerable help to manage diabetes during Ramadan, and indeed the local community may need more educating and urging not to fast if they have diabetes" (Chowdhury et al., 2003). Health care providers need to arrange special classes to enhance T2DM patients' self-management during this month (Chowdhury et al., 2003)**.** They should advise patients to drink more fluids during Ramadan as creatinine concentrations during Ramadan increase significantly (Belkhadir et al., 1993). They also need to provide information about the recommendations during fasting and the therapeutic changes. "Patients should be warned against skipping meals, taking medication irregularly or night time gorging" (Beshyah et al., 2007).

Mohamed et al. (2013) conducted an intervention among 430 patients with T2DM living in Doha, Qatar. Patients were randomized to either intervention (n = 215) or a control group (n = 215) to assess the effectiveness of a cultur sensitive, education program on biomed and the measures of KAP. The culturally sensitive intervention was about the diabetes pathophysiology and complications; healthy lifestyle dealt with exercise benefits and using counseling techniques for enhancing attitude and practice. "After 12 months, participation in the intervention was shown

to lead to a statistically significant reduction in HbA1C in the intervention group (−0. 55 mmol /L, P=0. 012), fasting blood sugar (−0. 92 mmol/L, P=0. 022), body mass index (1.70, P=0. 001) and albumin/creatinine ratio (−3. 09, P< 0.001) but not in the control group. The intervention group also reported improvement in diabetes knowledge (5.9%, P<0.001), attitude (6.56%, P<0.0001), and practice (6.52%, P=0.001)" (Mohamed et al., 2013).

2.4.3 Social Determinants of Health (SDHs)

Besides the pharmacological interventions and lifestyle modifications, the social determinants of health comprise the living conditions that impact the health of Saudi Arabians that are shaped by the way in which power and resources are distributed within the country(Commission on Social Determinants of Health, 2008). They include access to health care, school and education, work and leisure conditions, rural and urban settings, and the chances to succeed in life. Mainly, these conditions result from government policies, laws, and regulations that influence the incomes from employment or social benefits, housing, access to health, social, and recreational services, and the implications of economic crises(Mikkonen& Raphael, 2010). Despite heavy spending on health care for diabetics by the Saudi Government, which was estimated at US$0.9 billion in 2010 (Alhowaish, 2013), substantial public policy action is yet to be implemented, with the exception of the Saudi National Diabetes Registry, which is an electronic tool that monitors medical and socio-cultural bases for both primary and secondary interventions (Asiri, 2015). As outlined by Blas and Kurup (2010), economically, technically and politically feasible, replicable, sustainable, and scalable interventions are required to cope with T2DM in Saudi Arabia. In terms of political feasibility, interventions should be suited to varying political contexts. Political feasibility is pertinent because inequities result from power relations between those in authority and the governed (Blas &Kurup, 2010).

Economically, Saudi Arabia isclassified as a high-income country with a thriving economy, which is substantially supported by oil exports from its rich reserves, located in the Eastern Province (Cole, n.d.). As at 2010, the country's gross domestic product per capita was $22,713 (WHO, 2013), which implies higher

incomes for Saudi Arabians. The high income has facilitated high budgetary spending on health care development and services are offered to all residents and expatriates working in the public sector at no cost (Almaki et al., 2011). Besides the MOH, various private sector entities are involved in the provision of services to residents at a fee. The main drawback in the health care system is the lack of coordinated communication channels, which results in wastage of resources that could be used to procure equipment, training materials, and proficient personnel (Almaki et al., 2011). However, the continued development of PHCs in various rural areas has enhanced service provision, including prescription and low medication costs. However, the PHCs are yet to achieve the primary objectives of providing effective health-education to the population. Mainly, this is attributable to skewed distribution of health care services and health care providers, particularly in the rural areas of Saudi Arabia, which has deprived susceptible groups such as the elderly, persons with disability, and adolescents of care (Kirsten &Karch, 2012; Almaki et al., 2011). Further, while the government caters for the health care costs, disparities exist between the wealthy and the poor in terms of access to quality health services that are often provided at a fee in the less overstretched and better equipped private sector (Kirsten &Karch, 2012).

According to the Oxford Business Group (2014), social spending in Saudi Arabia amounted to US$228 billion in 2014, which was a 4% increase from US$218.7 billion in 2013. This was partly due to the provision of unemployment benefits, with 5.5% of the total workforce being unemployed in 2013. Unemployment is likely to result in physiological stress that weakens the body's immunity and may predispose a person to serious illnesses such as cardiovascular diseases and T2DM (Mikkonen& Raphael, 2010). Additionally, unemployment could lead to psychologicalstress that provokes feelings of shame and unworthiness that may inhibit persons from participating in lifestyle modifications, particularly physical exercises and dietary regimen. Further, individuals often adopt unhealthy coping habits such as cigarette smoking, alcohol consumption and binge eating. As a result, deprived individuals are highly inaccessible and primary interventions such as health education are ineffective in improving their quality of life (Kirsten &Karch, 2012). To resolve this, the policy makers must holistically address the unemployment issue and improve the living conditions in the population.

Previous studies have consistently shown a higher level of misconception about T2DM etiology and complications among illiterate compared to literate Saudi Arabians (Sabra et al., 2010; Alsuni et al., 2014). The overall literacy rate among Saudis aged 15 years and older was 88% (males 91%; females 85%) (WHO, 2013).These literacy levels reflect a high access to education for both genders and have a great influence on health promotion. Mikkonen and Raphael (2010) note that education is associated with the income level and employment security of an individual. As such, literate individuals are capable of evaluating the health implications of the actions that they undertake. Additionally, it is easier for literate individuals to influence the societal and political factors that affect their health and to leverage on the available resources to achieve better health. With this in mind, schools are major facilitators of health promotion programs, and the Saudi government needs to increase education funding to enhance access across all the socioeconomic groups (Mikkonen and Raphael, 2010)

2.5 Prevention and Self-Management Interventions for T2DM

The current high T2DM prevalence rates among male adults in the KSA are indicative of the lack of effective preventive, self-care and self-management measures. Preventive strategies such as good nutrition and involvement in regular physical activity can promote positive lifestyle changes (Al-Quwaidhi *et al.*, 2014). A group of researchers, the DREAM (Diabetes Reduction Assessment with Ramipriland Rosiglitazone Medication) Trial Investigators (2006), conducted an international prospective clinical trial to assess the efficacy of rosiglitazone in reducing the diabetes frequency among persons with Impaired Glucose Tolerance (IGT) or IFG or both. The inclusion criteria of the study included either IFG $\geq$ 6mmol/L but < 7 mmol/L, or IGT < 7 mmol/L while the exclusion criteria included a history of diabetes except gestational diabetes, cardiovascular disease, or intolerance to either angiotensin-converting enzyme inhibitors or thiazolidinediones (DREAM Trial Investigators, 2006). The researchers randomly assigned the participants to Rosiglitazone (n = 2635) and matched placebo (n = 2634). Participants in the rosiglitazone group were administered 4mg of rosiglitazone daily during the first two

months and 8mg daily thereafter. Additionally, participants were randomly allocated to ramipril (15mg daily) and matched placebo. The study's primary outcome was the incidence of diabetes or death due to the fatal causes during the period of treatment. Results obtained from the study showed that a three-year daily dose of 8mg of rosiglitazone resulted in a reduction in the case of T2DM among adults with IGT or IFG or both (DREAM Trial Investigators, 2006).

In the STOP-Noninsulin-Dependent Diabetes Mellitus Trial (STOP-NIDDM), Chiasson et al. (2002) evaluated whether acarbose treatment reduces the levels of post-prandial plasma glucose among patients with IGT, and whether the treatment can reduce the risk of T2DM, CVD, and hypertension. The international study included patients in hospitals in nine countries, aged between 40 and 70 years who are with a BMI between 25 and 40 kg/m^2, fasting plasma glucose between 100 and 140 mg/dL, and IGT measured according to WHO criteria. Patients with cardiovascular cases in the last 6 months were excluded from the study. The researchers randomly assigned the eligible patients to acarbose (a dose of 100mg acarbose taken thrice per day with the first bite of each meal; n = 714) and placebo (n = 715).The blood pressure levels and concentrations of fasting plasma glucose were evaluated every 3 months (coordinating nurse) and 6 months (investigator) for three years. The outcomes of the study included the new cases of hypertensions and major cardiovascular cases (Chiasson et al., 2002). The results showed a substantial decrease in the risk of cardiovascular events among patients treated with acarbose; hazard ratio (HR) = 0.51, 95% CI = 0.28 to 0.95, p = .03. Additionally, the result of acarbose treatment revealed a significant decrease in the risk of hypertension; HR = 0.66, 95% CI = 0.49 to 0.89, p = .006. Importantly, the study showed a significant change in various outcomes from baseline, for instance, BMI, weight, and triglycerides. Therefore, acarbonase is effective in reducing cardiovascular events among patients with IGT. The study by Chiasson et al. (2002) is significant due tothe cause of mortality among persons with T2DM, which is CVD, and effective control of CVD risk factors using acarbonase will improve patient outcomes.

The active care of T2DM, including the provision of self-care education, is associated with better clinical outcomes, particularly improved glucose control (Mumu et al., 2014). However, as Moreno et al. (2013) affirms, the efficacy of self-

care education programs for T2DM patients is dependent on the integration of such programs into the daily practice of health care providers. The programs should attract the support of the patients to increase compliance to therapy and adherence to other self-management practices such as physical activity and proper diet (Khan et al., 2012; Parajuli et al., 2014). A study by Aljohani (2011) on the factors that affect self-management among T2DM patients in Almadinah, Saudi Arabia, revealed that the compliance level with self-management practices, such as engaging in physical activity,monitoring the level of blood glucose, compliance with prescribed medication, proper diet and foot care, was low among the participants. As such, the study calls for active participation of health care providers to establish effective strategies to facilitate self-care among diabetics. Further, as noted by other studies (Khan et al., 2012), the study pinpoints the need to introduce novel changes to the Saudi Arabian health care system, including the increased coordination of patient care and provision of safe T2DM medications.

An uncontrolled quasi-experimental intervention study with pre-post assessment by Al-Asmary et al. (n.d.) evaluated the effects of a multidisciplinary care program among patients with T2DM in Riyadh, Saudi Arabia. The study recruited a sample of 47 male and female patients, 18 years or older, attending the chronic diseases clinic at Al-Wazarat Health Care Center. Inclusion criteria for the integrated care program included poor glycemic control, failure to respond to maximum insulin dose, comorbidity such as renal and cardiovascular disease, uncontrolled chronic diseases with maximum combined medications, need for diagnosis verification, noncompliance to insulin therapy, and inadequate continuity of care (Al-Asmary et al., n.d.). The intervention included standard diabetic care following the recommendations by the American diabetes association (ADA) and patient-based strategies for improving care. Changes in the levels of HbA1c, fasting blood glucose, lipid profiles (low- and high-density lipoprotein, cholesterol, triglycerides, and total cholesterol), and blood pressure were assessed after the intervention. The study's findings showed an improvement in glycemic control by 20%, including a decrease in the levels of HbA1c by 1.9% and FBG by 3.3 mmol/L. However, the intervention had no significant effect on the blood pressure of the subjects. In this regard, the integrated care program was successful in improving the outcomes of Saudi patients with uncontrolled T2DM except those with renal

diseases. In summary, the literature review indicated there is a gap on the knowledge, attitude and practices (KAP) of male patient T2DM patients in rural and urban populations of Riyadh, Saudi Arabia.

2.6 Current policies, strategies and action plan of T2DM

KSA is one of the largest and wealthiest countries in the region of Middle East and North Africa (MENA). As a leading oil-producing country, KSA has witnessed massive socioeconomic developments in the past five decades with rapid urbanisation and changes in population-based lifestyles. This has come with an increase in the number of T2DM patients. The visits of this group of patients to the clinics are infrequent, leading to a sporadic monitoring of their condition and an improper adjustment of their medications.

The overall policy of the Ministry of Health is associated with reducing and delaying the incidence of disability and premature death due to complications of diabetes. This policy was enacted due to the risk associated with the high prevalence rate of T2DMthat was being recorded in KSA. The final policy implemented by the Ministry of Heath was to reduce loss of life of people with diabetes by providing medication to all public hospitals for free (Ghotbi & Kermanchi, 2013).

The Saudi government is already allocating significant amounts of money and resources towards the treatment and management of this epidemic (Alwin et al., 2017; Alanzi, 2018; Alhowaish, 2013). This cost burden has led to development and adoption of different policies and strategies to address the T2DM epidemic. One of the key policiesassociated with managing diabetes and other NCDs in the Kingdom is healthcare education, which entails using learning experiences to improve health outcomes by enhancing knowledge about a disease and influencing positive behaviour/attitude changes (Al-Hashem, 2016). The Saudi government has been keen on using healthcare education to boost public knowledge and attitudes towards the risk factors associated with diabetes as one of the main strategies for addressing the problem. Through such healthcare education programs, the government has been able to inform people about the risk factors, symptoms, treatment options, and prevention strategies for T2DM. For example, by printing free pamphlets containing such

information and distributing them to the public through strategic distribution points such as in healthcare facilities, the government has been able to spread the knowledge about the disease.

Another policy approach has been the tracking and recording information regarding the disease, especially prevalence rates, on a regular basis. The Ministry of Health (MOH) has regularly kept and updated records of people with diabetes as one of the strategies for its management (Alharbi, Alotaibi,& De Lusignan, 2016). Today, the MOH maintains an updated record of people diagnosed with diabetes including the specific type of diabetes. Such data has been useful in informing other policy approaches as well as decisions regarding budgetary allocation to diabetes prevention and management.

Moreover, the MOH developed a long-term action plan for controlling diabetes in the country. The 10-year plan that covers the period between 2010 and 2020 has been in place and has resulted in major initiatives such as construction of specialized centres for the treatment of the disease (Alharbi, Alotaibi & De Lusignan, 2016). The establishment of these centres has seen the number of diabetes patients seeking professional help grow over the years. Moreover, through these centres, the government has been able to monitor diabetes patients and trends.

2.7 Summary

The literature highlights the concerning increase in prevalence of T2DM worldwide and in particular in the KSA. The increased prevalence in the KSA has been largely attributed to rapid urbanisation, which has especially influenced diet and physical activity. While some research has been conducted in the KSA there is limited qualititiev data which explores the influences of T2DM management. While some interventions have been implementedwith the aim of preventing and enhance management of T2DM there remains much to be done to combat this epidemic.

Chapter 3 Methodology

3.1 Introduction

This Chapter outlines the methodology that was used to attain the objectives of the study. This study used qualitative approach to collect data from Saudi Arabian Males living in Riyadh Region with T2DM.The research design, location of the study, study population, sampling procedures, instrumentation, interview process, and validity, reliability of the instrument, data collection and analysis procedures will be described.

Research methodology is a strategy that outlines the approach that the researcher applies in problem solving. The choice of a specific methodology is based on the type and features of the research problem. In this study, the researcher employed a qualitative research methodology to explore the knowledge, attitudes and practices (KAPs) of Saudi male T2DM patients in Saudi Arabia and to obtain holistic view and opinion of the health care providers engaged with T2DM patients in Saudi Arabia. "Qualitative approaches characterise a flexible, in-depth analysis, and the potential to observe a variety of aspects of a social situation, allowing the researcher to gain a more in-depth understanding of the participants' beliefs, attitudes, or situation" (Berg et al., 2004). Specifically, the researcher used a qualitative method of semi-structured interviews that allowed the patients to express responses in their own way and pace. In the semi-structured interview the interview guide is there is to guide the questions – additional questions can be added and the guide can be modified as the interviews progress. Hence, it is important to analyse data as collected (Kathuri and Pal, 2003). The researcher used a semi-structured interview guide that systematically outlined the questions to be explored and helped to maintain the focus of the interviews. The interview guide questions included the core questions and the associated questions of the main research question. The researcher recorded the responses of the participants to capture the data while focusing on the content and verbal prompts.

3.2 Method/ Study Design

Few published studies exist on the KAPs of adult male T2DM patients in Saudi Arabia. Among the published studies, a majority have applied a quantitative methodology, which is a positivist approach to research. The positivist approach makes use of existing theory to establish the research hypotheses that are tested and wholly or partially confirmed or refuted. In this regard, the approach assumes that human behaviour is passive and influenced by the external environment (Dash, 2005), and observations can be made from an objective viewpoint (Rubin &Babbie, 2011). On the contrary, social reality is complex and comprises multiple layers, with a single phenomenon having multiple interpretations (Dash, 2005). Therefore, an anti-positivist approach, interpretive, is preferable to facilitate an assessment of the unexplored dimensions of self-care and self-management practices of adult male T2DM patients in Saudi Arabia. Interpretive emphasises on the role of humans as social actors and asserts that humans interpret their social roles according to the meanings that they attach to the roles (Dash, 2005). In this case, the grounded theory approach was used in this study and the analysis of collected data was going progressively to determine the themes, which emerged (Silverman et al., 1990).

The goal of the grounded theory was to make the theoretical assertions, which will be verified and examined. Moreover, they will be inductive as well as conductive (Strauss & Corbin, 1998). The progress aims to enable the clarification of attitudes, perceptions, and behavious concedering to processing of the main opinion and concerns on the subject (Bluff, 2005). The choice of a qualitative methodology using grounded theory for this study was mainly due to the inability of the positivist approach to identify and provide tentative explanations for various social and psychological processes, for instance, those that adult male Saudis develop to self-manage T2DM, and to take into account the socio-cultural environment in which the processes occur. In the context of human behaviour, a quantitative methodology would be deficient in documenting the emotions of patients after disease diagnosis and during self-care and self-management. Additionally, the quantitative approach cannot account for the meanings, motivations and actions of the patients in their daily self-management practices (Coventry et al., 2014).

Importantly, the qualitative methodology is highly compatible with the researcher's role as a health care provider. One of the overarching aims of the researcher is to improve public health outcomes by enhancing the capability of diseased populations to cope effectively though education. Public health specialists are well positioned in the integrated health care system and have a crucial role of enhancing the KAPs of patients with T2DM (Bluff, 2005). The researcher applied grounded theory in an attempt to interpret the responses of the study participants to explain how meanings are derived in the day-to-day self-management and self-care practices by linking patterns and relationships that explain the social process (Dey, 1999). Further, the application of grounded theory yields in-depth information that helps to identify, explain, and understand the psychosocial processes involved in the management of T2DM by adult Saudi males in their socio-cultural settings. The information obtained is crucial to derive accurate interpretations of the behaviours of the participants in their natural settings. This emphasizes the ability of qualitative research to yield in-depth information about human behaviours, which may not be conveyed quantitatively. The researcher's role is to investigate, in a social context, human behaviours, interactions, and experiences and the thought processes about them (Glaser & Strauss, 1967).

The actions of individuals are a response to thoughts and interpretations of a phenomenon. In particular, self-management of T2DM is an individual process in which patients individually process and interpret the disease. On one hand, the actions of the patients result from the meanings they hold about the situation while, on the other hand, the situation gets its meanings from the interpretations and definitions of the patients. Among adult Saudi males, self-management and self-care is congruent with the meanings that they hold about T2DM. The past plays a crucial role in the formulation of meanings although it has a partial influence on the present actions. In this case, T2DM management is a process in which a patient actively participates by determining their actions. Based on the definition of the situation and the meanings attached to T2DM, the patients may self-determine to manage or not manage the disease. Therefore, the researcher must get close to the patients to establish their definition of the situation and the meanings for their self-management

actions. Consequently, this will facilitate explanations of the meanings and social symbols of diabetes management from the patients' socio-cultural settings.

The main aim of grounded theory is to generate theory while addressing prior knowledge and ideas, as well as the selection, coding, and data analysis. This research utilised the grounded theory approach formulated by Strauss and Corbin (1998) and various tools were used including theoretical sampling, constant comparison, coding, and theoretical saturation. The study used the constructivist ground theory. The grounded theory methodology employs purposive sampling using theoretical sampling whereby the selection of the study participants is based on their ability to provide information for generating and developing theory (Glaser & Strauss, 1967). Through theoretical sampling, participants are not recruited at once, but the evaluation of the T2DM among the participants was accessed to ensure the participants was in deed suffuring from T2DM. This was done by evaluation the knowledge of the participants of T2DM and uses them to develop the themes (Sbaraini et al, 2011). Evidently, theoretical sampling and data analysis are simultaneous processes that result in refined and saturated categories. The categories are termed as saturated when no new data can be obtained from the participants (Strauss & Corbin, 1998).

In using grounded theory, the process of data collection includes the constant comparison (Glaser & Strauss, 1967; Strauss & Corbin, 1998). The researcher constantly compares the interview transcription data from the first interview with the data from subsequent interviews. According to Boeije (2002) and Strauss and Corbin (1998) a constant comparison can be continually obtained from coded data where the themes were extracted based of theory. Besides enabling the researcher to observe the actions of the participants and the interactions in the social settings, constant comparison analysis acts as a guide for subsequent interviews. Hence, this study utilised constant comparative analysis to code themes that emerged from data (Becker, 1998; Silverman et al., 1990). The results of constant comparison analysis facilitate refining and exhausting categories, which results in the generation of either formal or substantive theory (Strauss & Corbin, 1998). While formal theories involve the examination of phenomena in various situational contexts to elaborate or modify existing theory, substantive theory emanates from the examination of a phenomenon in one

situational context (Strauss & Corbin, 1998). The study adopted the substantive approach to theory generation by evaluating the KAPs of adult male Saudis with T2DM.

The theory is developed around a core category, which denotes the overarching theme from which the other themes arise. The prime mover or the main concern in this study was self-management and self-care among adult male patients with T2DM in Saudi Arabia. In this regard, grounded theory represented the theory of how the adult male T2DM patients continually deal with self-care and self-management as influenced by their KAPs and those of health care providers in primary health care facilities. In conducting the study, the researcher deduced that T2DM management actions occur in the social context of Saudi males, and these actions are a reflection of the nature and individual experiences of the disease. The research assessed the pattern of behaviour, including the actions and interactions, which develop among the participants while managing T2DM as influenced by various socio-cultural factors.

3.3 Sample /participants and setting

This research comprised three samples, including Saudimale T2DM patients diagnonised with T2DM for the last 12 months and health care providers (physicians and nurses). The first and second samples comprised male T2DM patients of Saudi nationality (self-identified) aged between 35 and 65 years based in rural and urban regions of Riyadh, respectively. The age group 35-65 years was chosen to represent midlife adults in Saudi Arabia and due to the higher prevalence of T2DM in this age group than in other age groups. The samples were distinct for rural and urban areas because it was likely that there may be differences between urban and rural males, which may affect T2DM prevalence and management. The third sample comprised health care providers from rural and urban areas who were currently treating male T2DM patients.

For this study, ten primary urban and rural health care centers (PHCs) were purposively selected (based on availability to participate) to recruit T2DM patients and the health care providers (physicians and nurses). These included five

PHCs in the rural regions of Riyadh and five PHCs in the urban regions (north, middle, south, west, and east of Riyadh city). At first, the study participants were purposively sampled based on the inclusion criteria. The study only selected consenting male patients who were diagnosed with T2DM for at least one year. They were selected based on records at the health care centers. Male patients were aged between 35 and 65 years and Saudi nationals based in five urban and five rural regions of Riyadh, which consists of five main geographical divisions. Patients who did not meet these criteria were excluded from the study.

The recruitment strategy for patients who met the study's inclusion criteria was based on purposive sampling. This approach involved a preselected criteria that was specific to the study's research question (Atkinson & Flint, 2001). Theoretical sampling guided the selection of an appropriate sample to facilitate gathering new information for generating and developing theory. Specific medical information pertaining to the participant's treatment schedule, level of control, and other complications were obtained from participants medical records. Also, demographic information, including age, nationality, education status, and marital status was collected. Based on similar studies, such as Peres et al. (2007), Lawton et al. (2006), Lai et al. (2005) and Peel et al. (2004), it was anticipated that the study would require a sample of about 40 T2DM (20 from rural and 20 from urban areas) patients; however, sampling continued until theoretical saturation was achieved.

In the case of physicians and nurses, purposive sampling was employed to select health care providers based on their availability to participate in the study. The inclusion of a sample of health care providers, including physicians and nurses at the PHCs, was to enable data triangulation and to provide in-depth information on the management of T2DM among male patients. Hence, through a purposive sampling method, health care providers who met the inclusion criteria, which included being male or female, registered as a physician or a nurse, and working in the purposive selected PHCs, were chosen for the study. Physicians and nurses were selected as they are the health care providers who are mainly involved in primary care provision at all the PHCs in Saudi Arabia (Khan et al. 2011; Aldossary et al., 2012). Based on similar studies, such as Al-Elq (2009), the study required about 20 health care providers of any nationality, including 10

general practitioners and 10 nurses. However, the appropriate sample size was determined by theoretical saturation (Mason, 2010). According to Bryman (2004) when there is no new or more relevant information emerge, then it indicates that theoretical saturation have been reached and themes will be well validated and developed.

The use of theoretical sampling involves the identification of information that pertains to specific events, incidents, and happenings (Strauss & Corbin, 1998). In this case, the inclusion of the participants was guided by the need for additional information for the emergent categories. Importantly, the researcher applied constant comparative analysis that compares the data being collected with the categories in use to refine the study's questions after each interview. Consequently, this yielded more focused and specific questions that were the basis of theoretical questioning, which seeks in-depth information for specific categories and evaluates the relationships and dimensions of the categories. Sampling, as well as data collection, ceased when there was no new information from additional participants and the categories were saturated.

3.4 Procedure

As a Saudi male, the researcher understands the cultural values, beliefs, and practices of the Saudis. In particular, understanding the unique expressions in the Arabic language helps to determine the various emotions exhibited by the participants during the interviews, for instance, anger and frustration. Also, shared knowledge on the attitudes of Saudis towards illness and their customs of using traditional remedies allows the researcher to adopt a non-judgemental stance while conducting the interviews. Importantly, as an insider, the researcher can gain the trust of the participants quickly, which influences the availability and quality of data for the research.

Additionally, the letters from the Curtin University and From Saudi MoH helped the main researcher in the data collection phase by authorizing the provision of a quiet room in the public area of the sampled PHCs for conducting interviews, and other support if and when necessary. To recruit study participants, the main researcher contacted the respective PHCs' managers in both urban and

rural areas of Riyadh region, and requested a confidentiality agreement with the health care managers of the selected health care centers. Based on the T2DM patient lists provided at the PHCs, all patients were contacted by telephone or by writing to schedule the appointment; however, the patients were free to accept or refuse to participate in the study at any point. At the first meeting, all patients were provided an information letter (Appendix A & A1), which asked them about their availability and interest inparticipating in the study. Interviews were then arranged at a time convenient to them. Participants were requested to report at the respective PHC on the preset date and time where interviews were conducted. The male T2DM patients who voluntarily accepted to participate in the study signed informed consent forms prior to commencing the interview. The interview used the Arabic language. Additionally, the researcher approached Physicians and nurses involved in the provision of care for diabetics at the 10 purposively selected PHCs. The Physicians and nurses were provided with information sheets and written informed consent forms that they were required to sign if they voluntarily accepted to participate in the study. They completed a short questionnaire (Appendix D1) detailing both demographic and specific information, such as age, nationality, years of work experience and training in diabetes management.

3.5 Instruments

The main instruments of the research included semi-structured one-on-one interview guides that were informed by the current literature and the study's research questions. The interview guides outlined the topics that the researcher would examine and allowed for flexibility in the style of the interview (Rubin &Babbie, 2011). Additionally, key questions were listed for each topic, with prompts for the interviewee to probe for specific issues that did not arise spontaneously. Using these guides, the researcher was able to adopt an informal, conversational style and adjust the sequence and wording of the questions while interviewing different participants. However, the interviewee was careful to avoid researcher bias and ensure that the techniques applied in collecting the research data are reproducible, credible, and transparent (Patton & Cochran, 2002). The bias in the research was prevented by conducting a pilot study, which included

fourd members from each group who are not part from the researcher's main study in order to be sure about the questions whether clear or not and to recognise the biased questions. Reproducibility dictates that another interviewer would obtain similar information when using the same interview guide on the same interviewees (campion & Hundson, 1994). This was achieved though content reliability where expert in the study and the school of public health evaluated the questionnaire. Credibility refers to a reasonable manner of asking questions, which results in the generation of valid research data. According to Patton & Cochran, (2002), credibility was achieved throughout the study by first creating a good relationship with the participants then using the language they all understood. Importantly, transparency requires proper written records to be maintained for the methods used in collecting and analysing the research data (Patton & Cochran). This was achieved by recording the interview as well as writing the responses.

Specifically, the instrument consisted of questions that were designed to test the KAPs of patients on three specific areas of self-care and self-management, including the disease aspects, physical activity, and nutrition. However, "qualitative research allows for the interview questions to be adapted and refined throughout the data collection process as unexplored phenomena are exposed" (Burns et al., 2008). Mainly, this occurs through constant comparative analysis where data collection and analysis are performed simultaneously to generate and develop theory. The participants from both the urban and rural areas were asked the same questions regarding their knowledge of T2DM prevention and management, their attitude towards T2DM prevention and management, and their practice (Appendix C). Health care providers, including the Physicians and nurses, were asked questions about the quality of health care services offered to T2DM patients at various rural and urban PHCs, the impact of the services to the patients' quality of life, and the barriers and enablers to the provision of quality health care services (Appendix B).

Initially, the interview guides for all the three groups were constructed in English. Forward and backward translation of the interview guide was conducted. Two bilingual translators performed translations of the English questionnaire into the Arabic. Another two bilingual translators, fluent in both languages, undertook

the backward translation of the interview guides from Arabic to English. These individuals were blinded to the original English version. Discrepancies that arose between the translated and the original interview guides were discussed to ensure that the Arabic version reflected the meaning of the original questionnaire. The main researcher practiced the interview and tested it on other Saudi males (n=24) attending Curtin University.

3.6 Interviews

The data for the research was collected using semi-structured, face-to-face interviews with patients and health care providers. All interviews were audiotaped. The semi-structured interviews allowed the researcher to understand and probe the meanings that the participants gave to various phenomena, which added depth to the data collected. However, the manner in which the researcher or interviewer interacts with the participants and frames the questions influences the nature of data collected, particularly concerning validity, reliability, and bias (Silverman, 2007). To obtain rich, valid, and reliable data, it is important to establish rapport with the participants by adopting an interactive and conversational approach to interviews as opposed to the formal approach. In this regard, the researcher needs to demonstrate credibility during the initial encounters with the participants to gain their confidence and develop a positive relationship that leads to a low likelihood of response bias. For instance, it is courteous for the researcher to seek permission from the interviewees to audio record the interviews.

The researcher is a student who is trained to conduct all the semi-structured interviews. The face-to-face interviews were conducted in Arabic language in a quiet room in the public area of the selected PHC centres, away from noise and other distractions, and were recorded on audio tapes. After each interview the researcher shared transcripts and recordings with the research team (supervisors). Emerging themes were discussed and explored at each subsequent interview. This relates to comparative analysis as elucidated by Strauss and Cobin (1998) where continuous data analysis results in theoretical questioning that involves the use of more specific interview questions in subsequent interviews.

To achieve credibility the researcher conducted participant validation by inviting a purposive sample of participants to comment on the interview transcript and whether the final themes and concepts created adequately reflected the phenomena being investigated (Bryman, 2004). Moreover, the researcher maintained a research diary documenting challenges and issues encountered in maintaining cohesion between the study's aim, design and methods. In addition, the researcher ensured that the bias was controlled by ensuring he was neutral and controlled emotions (Pattson, 2002). The study also used only one interviewer for data collection to minimize bias (Pattosn 2001). The respondents were assured of confidentiality to ensure that the participants gave true data. Similarly, the same interviewer conducted interviews with primary health care providers using either English or Arabic language. Health care providers in the different Saudi PHCs are from different nationalities, including different Arab countries, Australia, India and Malaysia. The researcher's choice to useeither Arabic or English language was based on the language that the health care providers felt the most comfortable (Almaki et al., 2011). The duration of each interview was between 45 to 60 minutes enabling the researcher to gain more information in order to reinforce emergent themes.

3.7 Analysis

Data analysis applied the inductive approach that involves the collection of data and exploration of themes (Glaser & Strauss, 1967; Strauss &Cobin, 1998). The inductive approach is necessary in this case because the study does not commence with a clearly defined theoretical framework, but relationships are identified between data and questions are developed and tested by means of theoretical propositions. However, the research begins with a clearly defined research question and objectives that may change based on the nature of data collected. The data collection and analysis processes play a crucial role in theory development.

The data collected from the participants needs to be analysed to derive useful meanings and develop theory. Since the data was qualitative, the analyses involve the application of qualitative data analysis procedures that include deductive and inductive approaches. Using these procedures, a variety of analyses

were performed ranging from simple categorization of responses to the identification of relationships among the categories. The complex nature of qualitative data necessitates that the data is summarised and categorised to facilitate meaningful analysis.

The research data, which was audio recorded, needed to be prepared for analysis through transcription. Transcribing required that the words of the interviewees be recorded into text exactly as they were uttered. In this regard, the researcher utilized the services of a professional transcriptionist to transcribe the audio interviews verbatim. While this reduced the amount of time required to transcribe all the audio interviews, errors could arise that could affect the findings adversely. To avoid possible errors, crosschecking the transcripts and audio interview enables the researcher to know the accuracy of the transcripts. Being bilingual, the researcher translated the Arabic version of the transcripts into English and re-translated the English version of the transcripts to Arabic in order to maintain the accuracy of the information. Additionally, the researcher consulted a bilingual translator to assess the transcripts to affirm the accuracy of the translation.

The researcher saved the translated transcripts in external memoryand sought help from research team when needed. NVivo (version 10) were used to analysis the data. Grounded theory tools were used, including constant comparison, theoretical sampling, memos, and field notes. Each transcript was analysed to determine various concepts, which were clustered into codes. Coding was conducted based on context whereby the transcripts were coded into respective themes in relation to the literature and data (Burns, Cross &Maycock, 2010; Burns, Maycock, Cross & Brown, 2008). The categories represented groups of concepts whose names were derived from the words of the research participants to indicate, at a higher level of abstraction, the patterns in data (Strauss & Corbin, 1998). Subsequent analyses involved constant comparison analysis of concepts and categories and refining the categories by adding more information to the categories in use or forming new categories. The researcher then assessed the patterns of relationships among the categories and sub-categories. To refine, link, and conceptualise the various categories, various coding procedures were applied

throughout the data analysis, including open, axial, and selective coding (Strauss &Cobin, 1998).

Open coding involves disaggregating data into units, examining the units, and identifying the underlying codes. Comparative analysis was applied in finding, naming, and developing concepts. In this regard, each transcript was carefully assessed to identify the thoughts, feelings, actions, and other interactions that occur among male T2DM patients during self-management and self-care. These concepts facilitated the development of initial codes to capture meanings, with initial codes having similar concepts being grouped into enveloping categories. Axial coding was used to assess the relationships among the categories and to develop a model that connects all the data. To derive a meaningful glimpse of social reality of the participants, selective coding was performed. Selective coding involves integrating, refining, and organizing categories around a core category. According to Strauss and Cobin (1998), the core category represents the study's main theme and may have meaningful relationships with other categories. Further, the researcher used diagrams and memos to aid in the analysis. Besides facilitating documentation of the analysis process, these analytic tools are useful in coding, for instance, memos provide clarifications for various questions during axial and selective coding while diagrams illustrate the relationships among the categories and sub-categories during open coding (Strauss &Cobin, 1998).

Transferability of the data was enhanced by development of themes through ground theory (Bryman, 2004). The researcher, under the guidance of the supervisors, cross-referenced the theme nodes as they emerged. This gives the researcher a better ground to develop knowledge of themes within the data (Glaser, 1992; Thorne, 2000). In addition, cross-referencing with the supervisors helped to avoid bias in the researcher's interpretations of categories by ensuring that the meanings are those given by the research participants. The trustworthiness of the research was based on credibility, which pertains to the participants' views about the truthfulness of the findings. This was ascertained by returning to a few participants (n=5) to validate that the categories accurately depicted their experiences. Importantly, the researcher enhanced the audit ability of the research by providing a full account of the research process. By logically and sequentially applying the grounded theory methodology and providing detailed, accurate

descriptions of the study, it is intended for the researcher to understand the process and judge the study's suitability to their practice and theory development. Further, the viewpoints and assumptions of the researcher concerning self-management and self-care practices of T2DM patients in Saudi Arabia could not be overlooked. As an insider, the values, beliefs and experiences of the researcher could influence the analysis of data; therefore, the researcher was reflexive to make the research the main focus of inquiry (Hsiung, 2010; Ortlipp, 2008).

3.8 Ethical Issues

Since the study involved human participants, it was imperative that the researcher observed the research ethics involved in the planning and execution of the study. In particular, the researcher addressed various ethical issues specific to the study, including informed consent, privacy, and anonymity and confidentiality. While the research involved minimal risk to the participants, informed consent was a prerequisite because personal information would be collected from the participants (Rubin &Babbie, 2011). Informed consent involves providing participants with information that is likely to influence their decision to participate. There are four main elements of informed consent, including competence, voluntarism, full information, and comprehension (Frankfort et al., 2008). By voluntarism, the participants were assured of their freedom to take part in the research. In his regard, the researcher ensure the participants was clear of the intention of the research explaining to them that will not affect to their visit to the medical centre whether they agree to participate or not. By full information, the participants were provided with important information about the conduct of the research. These included explanations about the research procedures, expected benefits, clarifications of inquiries about the procedures, and a disclosure that the participants had the right to withdraw consent and drop out from the research at any time. Based on comprehension, the researcher ensured that the participants understood the research before providing consent by allowing a reasonable time lag and room for consultation between the time of request for consent and the decision (Appendix B).

Safeguarding the privacy of participants' information is vital to ensuring their right to privacy, which guarantees an individual the freedom to choose the time, circumstances, and extent to which the researcher shares with or withholds from third parties information regarding their opinions, beliefs, attitudes, and behaviour (Frankfort et al., 2008). Privacy is evaluated from three standpoints, including the sensitivity of information, settings of the research, and dissemination of information. It would be detrimental to publicize information that negatively portrays the research participants by revealing their background and social standing. Additionally, within the public settings in which the interviews were conducted, the researcher ensured privacy by allowing only the interviewer and the interviewee in the interview room. Further, the information obtained from the research was de-identified to prevent matching personal information with the identities of the participants. In this case, the researcher used confidentiality to protect the study's participants. Identifying information, including names and addresses, was excluded from the main data file. The data file was stored in a secure database in Curtin University while the audio tapes were stored in a securely locked cabinet and access to the data was limited except for legitimate purposes (Rubin &Babbie, 2011). The exclusion of identifiers made the information confidential, with no possibility of linking the information with the participants even when the information is made public. All participants were informed that their names and addresses would not be recorded to ensure anonymity. Participants were provided with information sheets and written informed consent forms that they were required to sign if they voluntarily accepted to participate in the study. The study was voluntary and participants had the right to withdraw at any stage of the interview.

This study was accorded ethical approval from Curtin University Human Research Ethics Committee (RDHS-258-15 dated 4-NOV-2015). The permission to carry out this study was obtained through the Saudi MoH with ethical approval number (15-361E dated 20-10-2015) in addition to the two authorization letters of physicians, including one from the main researcher's external supervisor, who provided support and supervision in order to access the respective PHCs. These letters assisted the main researcher in the recruitment phase by introducing him to potential participants who met the inclusion criteria of the study based on their

medical records. Furthermore, Dr. Sameer Al Hamid, Royal Clinic, Formal Medical Director, MoH and Dr. Awad Alshahrani, Consultant, Division of Endocrinology, King Abdulaziz Medical City granted approval for the study in Saudi for National Guard, MoH.

3.9 Facilities and resources

The Saudi government provided monthly payment in Australian dollars, including life expenses and the needed study materials (buying books and other resources), to fund this research. This grant-in-aid for maintenance and consumables assisted with the cost of the research project. In the course of proposal writing and questionnaire development, the researcher utilised Curtin University's computers and library. The Curtin University consumables allowance ($2000 per annum) was used for incidentals and transcription costs.

3.10 Summary

This qualitative study has adopted a Grounded Theory approach. Data were collected via semi-structured one-on-one interviews. Participants included urban and rural males aged 35 to 65 years from Riyadh, KSA and health care providers working in these areas.

Chapter 4 Results

4.1 Introduction

This chapter presents the findings of the qualitative study based on themes that emerged following the interviews with each group. This qualitative study interviews of patients from rural and urban areas and rural and urban health care providers in Riyadh, Saudi Arabia. The chapter initially describes demographic characteristics of the participants from each group. The themes and sub-themes are discussed by participant group.Self-management is one of the commonly used approaches to the treatment and management of diabetes.Among the key elements of self-management for diabetes are knowledge about the disease, management of diet and physical exercise. Patients that are able to balance these three aspects effectively tend to have better self-management outcomes. Such patients are able to use their knowledge about diabetes to monitor and manage their diets as per the directions of their doctors as well as engage in physical activity as part of the positive lifestyle changes that are essential for diabetes treatment and management.Self-management has a direct implication on HbA1C levels in the body.Self-management that integrates the use of proper diet, physical exercise, and knowledge on diabetes to manage blood glucose levels can be essential in reducing HbA1c levels as well as mitigating some of the long-term complications associated with diabetes.

4.2 Demographic Characteristics of Rural Patients

Twenty rural patients were interviewed. The majority of participants who had been diagnosed with T2DM had lived with it for between 1-5 years (40%) and 6-10 years (40%) (Table 4.1)

Years with T2DM	Frequency	Percentage (%)
1-5 years	8	40
6-10 years	8	40
11- 15 years	1	5
above 15 years	3	15
Total	20	100

Table 4.1 Duration of T2DM diagnosis for rural patients

4.2.1 Influences of T2DM management among rural patients

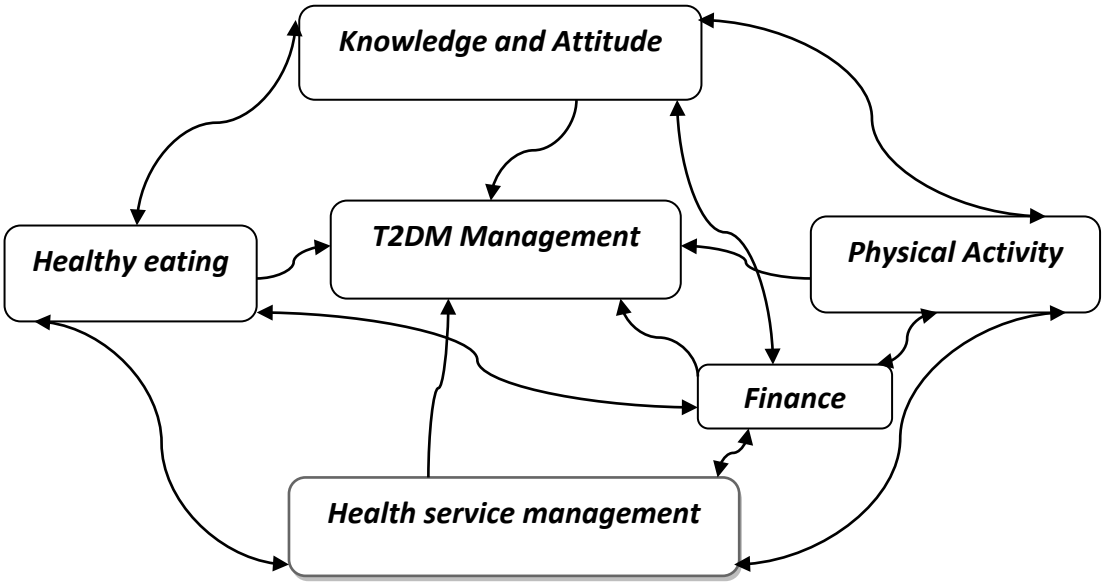


Figure 4.1 Influences of T2DM management among rural patients

Figure 4.1describes the five key themes which emerged from the data to describe the influences of *knowledge and attitude* towards self-management of T2DMamong rural male patients. The model shows the interaction between themes and the management of T2DM. The model describes the five themes and their interaction: *Knowledge and attitude* (sub themes: individual, family, and society); *Healthy eating* (sub themes: individual, family, and society); *Physical activity* (sub themes: individual, family, society); *Health service management*; and *finance*. Every theme contained subthemes; *individual, family* and *society* except *health services management*and *finance*. *Knowledge and attitude* influence *healthy eating* and *physical activity*. The theme *healthy eating* directly relates with the themes *health service management*, *finance*, and T2DM management. The theme *finance* is directly related with the themes *physical activity*, *healthy eating*, *knowledge and attitude* and *health service management* and has a direct relationship to T2DM management. The theme *physical activity* relates to *finance*, *health service management*, and *knowledge and attitude* and influences T2DM management. The theme *health service management* influences *healthy eating*, *physical activity*, *finance*, and directly influences to T2DM management.

4.2.1.1 Knowledge and attitude

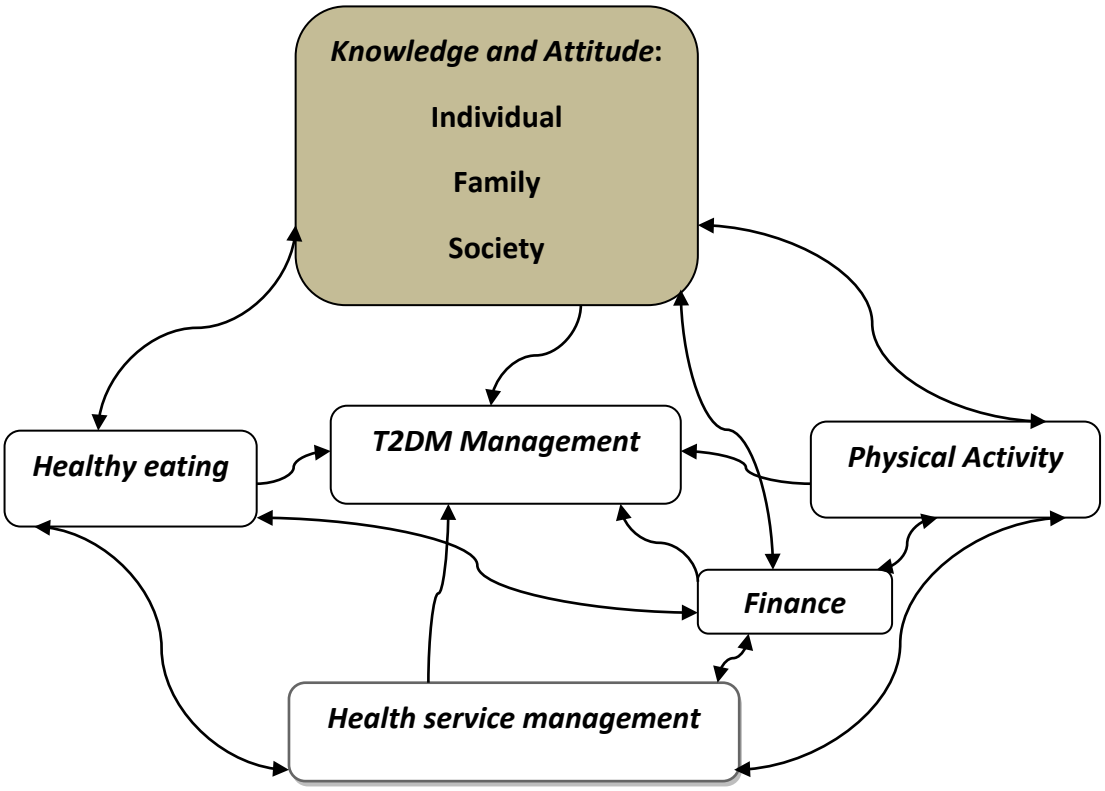


Figure 4.2 Influences of T2DM management among rural patients highlighting the theme *knowledge and attitude*

The theme *knowledge and attitude* includes sub-themes, individual, family and society (see Figure 4.2).In this study, knowledge refers to the awareness of T2DM on its symptoms, treatment, and *self-care*. Attitude refers to how patients think about their T2DM diagnosis. The theme *knowledge and attitude* consists of the sub-themes individual, family and society. These sub-themes represent influences at an individual, family and societal level. The sub-theme individual describes how the *knowledge and attitude* of individuals influence management of their T2DM. This sub-theme represents their *knowledge and attitude* before and after they were diagnosed with T2DM, and their *knowledge and attitude* towards the management of their T2DM. Similarly, the sub-themes family and society reflect participants' perception as to how *knowledge and attitude* of family and society impact the management of T2DM.

4.2.1.1.1 Individual level of knowledge and attitude

Knowledge and attitude emerged as a key theme influencing management of T2DM. In some cases, *knowledge and attitude* positively influenced management; while for others who had limited knowledge, the influence on management was negative. Within the theme of *knowledge and attitude*, the sub-theme of individual's *knowledge and attitude* emerged. Most rural participants demonstrated low levels of awareness of the specific symptoms and causes of T2DMprior to diagnosis. Only a few participants were concerned about symptoms and went to the hospital to be checked for T2DM before they were diagnosed. The majority of participants were diagnosed by the HCP during a visit to the hospital when they presented to be treated for other diseases. The data indicates most participants had low knowledge of the signs and symptoms of T2DM.

Only a few rural participants demonstrated good specific knowledge of T2DM, including the name of the disease and symptoms before their diagnosis. Despite the disease being common in Saudi Arabia, with many having friends or relatives with T2DM, the majority of participants were still not aware of the symptoms and hence did not recognize the disease before being diagnosed. This was highlighted by RP1:

> *As some of my brothers were diabetics, I had known too much about reasons, and medicines of diabetes. Despite this I was not aware I have the disease.*(RP1-50 years)

After diagnosis, awareness increased with participants discussing and sharing information around T2DM symptoms, prevention and maintenance behaviors such as *physical activity*, good eating and reduced stress. In addition, participants also discussed receiving information about T2DM through social media and publications, for example:

> *Information about diabetes through social media and publications which distributed in hospitals, like it's not that dangerous disease to frighten you but it's not that too simple to ignore it.*(RP10-36 years)

A few number of participants discussed being aware of the symptoms and treatment of T2DM before the diagnosis. Some also discussed the cause of T2DM being related to eating including consumption of excess sweets or dates which cause excessive thirst and urinating. This is highlighted by RP19:

> *I had some information about it from diabetics around, after I recognized the disease, my knowledge about the disease and symptoms and medication had become greater, like urinating and thirst.*(RP19-51 years)

Lack of awareness and knowledge of the disease had a negative impact on the health of participants and impacted relationships with relatives, family members and/or friends.

> *I was experiences sexual disfuntion but i was not aware that it may have been brought by the T2DM until i was informed by the doctor. (RP14- 45 years)*

Participants also felt that after T2DM diagnosis, their knowledge about the disease increased due to information provided by HCP.

> *I had known some information about it from diabetic relatives. Now I know even more after I got the disease.* (RP18-64 years)

> *I received information about best health facility treating diabetics around, after I recognized the disease, my knowledge about the disease and symptoms and medication had become greater.* (RP18-64 years)

The majority of patients discussed not feeling that they had any control over whether they got T2DM or not. Given genetic influences, they did not think their behaviors, such as *healthy eating* and/or *physical activity*, would prevent T2DM. Some rural patients viewed treatment as ineffective due to genetic predisposition they felt treatment and prevention measures would not improve their condition.

My father and mother were diabetics, therefore some of our children might have the disease.(RP19-51 years)

4.2.1.1.2 Family related influencers

The subtheme 'family' emerged to explain the influence of family member's *knowledge and attitude* on rural patients T2DM management. Participants described family members offering support and providing information, especially around healthy food. The majority of participants discussed being given proper treatment, encouragement and support from family members. This encouraged them to come to terms with their T2DMdiagnosis.However, the majority of rural participants kept their T2DM diagnosis secret between the wife and husband and did not disclose their diagnosis to other family members. Rural participants discussed the social stigma associated with T2DM.A few participants discussed hearing about situations where marriages were destroyed due to T2DM. RP6 highlights some of these issues, including issues around T2DM impacting sexual performance:

I think his wife escapes from him because of relaxant penis due to diabetes. I know a woman who refused to engage a good man just because he is a diabetic.(RP6-54 years)

The community sees diabetic as patient in very bad situation, some families may refuse his request of marriage.(RP10-36 years)

Our community sees diabetic patient as deformity.(RP10-36 years)

Some participants struggled to tell their family about their diagnosis. This is highlighted by RP16 who kept his diagnosis hidden for 15 years and byRP18 who had not discussed his diagnosis with anyone apart from his wife.

I hide this truth from my family for about 15 years without telling them till they lately know.(RP16-55 years)

To be honest with you, no one considers our situation except my wife.(RP18-64 years)

4.2.1.1.3 Society related influencers

The management of T2DM is also influences by societal *knowledge and attitude*. The knowledge of community members on T2DM and their acceptance of the patients suffering from T2DM influenced the rural patient's management of their T2DM. Although family members were generally supportive of their T2DM diagnosis the majority of participants felt they were generally not accepted by other community members. This may be associated with knowledge about T2DM which also impacts attitudes.

I could always see my neighbors looking at me with suspicious eyes when in community work.(RP5-58 years)

They felt this was because the community does not properly understand the disease. The majority of participants felt discriminated and hence, they tended to hide their diagnosis to avoid the stigma and discrimination. RP17's comment highlights the lack of understanding of T2DM indicating that he was often excluded from community activities as community members felt he may not cope with the activity:

I could be left out in many of the community activity by member of the society. I attributed this to fear of community that I may fell sick during the activity.(RP17-57 years)

RP2 and RP8 highlight the lack of support at a societal level. There appears to be fear associated with T2DM and the maintenance of the disease. In addition, community members perceive the control of T2DM to be the individual's responsibility and not the role of the community. RP2also highlights the importance of increased community awareness and the need for the culture to change.

Community sees diabetes as one of the most dangerous diseases and needs special concern.(RP2-49 years)

Society is not always supportive to diabetics and commitment is patient's own responsibility.(RP8-52 years)

4.2.1.2 Healthy eating

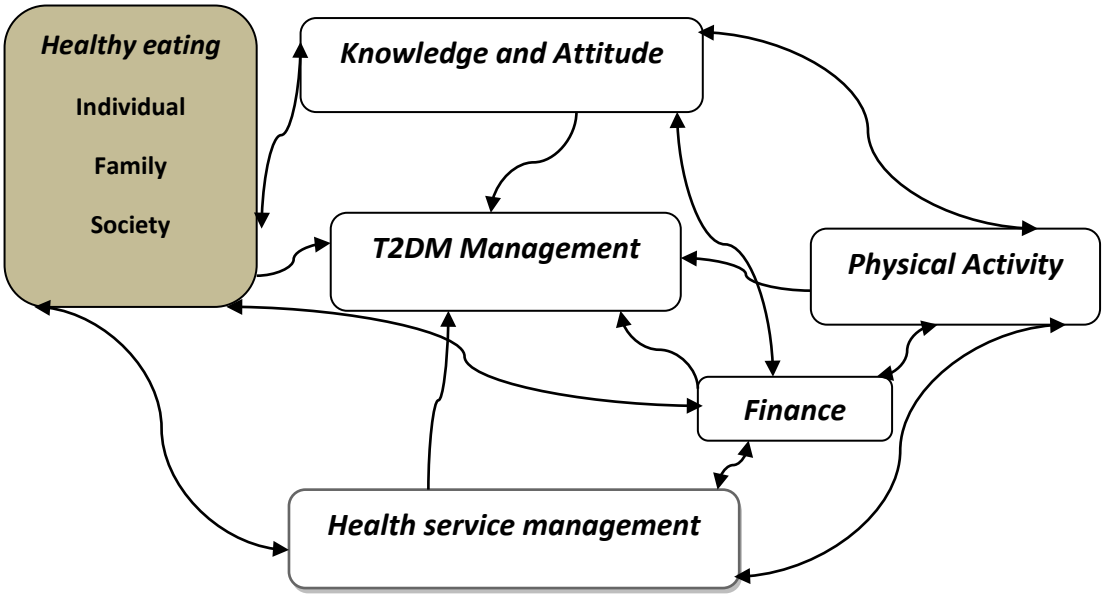


Figure 4.3 Influences of T2DM management among rural patients highlighting the theme *healthy eating*

4.2.1.2.1 Individuals related influencers

Figure 4.3 shows sub-themes related to *healthy eating* among rural patients. The majority of participants were aware of the importance of *healthy eating*. In general, participants tried to eat food that was not expensive and locally available. They tried to consume foods that would lower their sugar levels. In addition, the majority of participants also understood that healthy food can assist management of the condition and increase their lifespan. The majority of participants were aware that the intake of sugar and high calorie food influencesT2DM. Participants were also aware of the important role of *healthy eating* and diet modification in maintaining their blood sugar levels and controlling T2DM. This is highlighted by the following:

By avoiding sweets and starches.(RP9-47 years)

Again, not at all, just sugarless tea at most.(RP11-37 years)

To keep on diet, practice sports, and avoid sweets.(RP11-37 years)

Diabetics can control diet if he has a strong determination especially when he knows that diet is the first step to medication and medicines are useless without diet, and in general he must avoid sweets and consult a nutrition specialist.(RP1-50 years)

Participant's recognised eating is important for the prevention and control of T2DM. As discussed by RP2:

I took it easy and I was convinced that I can control it through diet and medication.(RP2-49 years)

This implies that patients are of the view that with proper medications and diet the disease can be controlled. The following support these findings:

By keeping on moderate diet and avoiding high sugar foods. (RP14-50 years)

Most participants expressed the view that a healthy diet is required for the prevention or control of diabetes. After diagnosis and their knowledge of the importance of eating grew, the majority of participants started maintaining proper diets as directed by their HCPs.

They should eat healthy foods, practice sports and take their medicine.(RP13-63 years)

Patient can control diabetes by following physician's instructions and nutrition specialist's instruction, if any.(RP16-55 years)

In addition to awareness of the benefits of a healthy diet, participants were also aware that consultation with either a nutritionist or a HCP should occur. The patients expressed the view that all diabetic patients should aim to maintain a healthy diet which is the first step for controlling diabetes. Participants recognized drug treatment will not be effective unless a healthy diet is maintained. RP7 highlights the importance of consulting a nutritionist:

> *He must consult a nutrition specialist and follow the instruction*.(RP7-61 years)

4.2.1.2.2 Family related influencers

Family members are an integral part in providing meals and supporting food choices. This section described the level of awareness family members have on *healthy eating* being important in the management of T2DM. Participants suggested immediate family members were aware that *healthy eating* is important for positive health outcomes for T2DM patients. In this study participants felt immediate family members generally supported T2DM patients to adopt a healthy diet.

> *Some of them are good but others aren't. Some of them use the food left from lunch to service in dinner or from one day to the following one.*(RP5-58 years)

This encouraged participants to consume healthy food. Some participants suggested family members were supportive and provided foods, which are high in fiber and low in fat and cholesterol.

> *They are very supportive; they provide me needful food and do their best to keep me away of sweets.*(RP11-37 years)

However, a few family members suggested the increased reliance on eating food from restaurants when they are at work and business, as opposed to food prepared at home, had a big impact on their diet. It was suggested this was more of an issue in Riyadh compared to the Northern areas of Saudi Arabia due to the

availability of restaurants. Participants discussed the availability and also the poorer quality of restaurant food compared to home cooked food.

> *In Riyadh you may eat more in restaurants which is not as good as home food because it is a busy area with many restaurants everywhere while in the north of Saudi Arabia there are no much restaurants.*(RP12-36 years)

4.2.1.2.3 Society related influences

The majority of rural participants did not disclose their T2DM status to people outside their family due to negative societal attitudes. From a societal perspective, T2DM patients in the rural areas felt they were not encouraged to eat healthy foods and that people look down on them as T2DM takes a lot of time to control and is associated with an inherited disease and family lineage. According to RP19, he does not eat eat food provided by community members as he cannot express that he suffers from T2DM to members of the community due to stigmatization and even rejection.

> *The community is not supportive all the time, and it is the patient responsibility to look for the healthy food.*RP19-(51 years)

RP6 suggests that management of T2DM is perceived to be the role of the individual and not the responsibility of the community. While patients are not forced to eat or drink at social functions, community members as a whole are not generally supportive and leave decisions up to the individual. Most of the food provided at social functions are unhealthy options, however participants expressed that they felt they needed to participate in the occasions as well as take the food provided.

> *In occasions and parties no one will force you to have anything, so it's up to you; you are the patient and the physician at the same time.*(RP6-45 years)

Limited healthy options at some social functions prompt patients to consider whether they should accept invitations to social gatherings. However, despite lack of options

some patients described how they managed food and beverage intake at these functions.

> *I think most people do not commit to diet as inviters never prepare food for diabetics and at the same time invitees cannot refuse having the food already prepared.*(RP12-36 years)

> *It is not easy especially if we will participate in the occasions and familygathering, the role of social life that we have to eat from what they provide useven if it hurts us but I do my best to avoid it or to refuse the invitation.*(RP20-54 years)

> *Now I never accept such invitations and all people close to me know that, but in some case I accept the very special invitations but I avoid sugar heightening foods as I can and eat only some fruits.*(RP20-63 years)

> *I drink a little and eat only barbecues and vegetables.*(RP13-63 years)

However, participants discussed that these events were not always inclusive and while some events included food suitable for diabetics other events did not. y.

> *The inviters in such occasions doesn't know who or how many of their invitees are diabetic so they don't prepare special food for diabetics, so the commitment is the responsibility of patient himself by consuming small quantities or even avoiding foods that don't fit them.* (RP5-58 years)

> *Same food is prepared for all diabetic and non-diabetic.* (RP3-46 years)

4.2.1.3 Physical activity

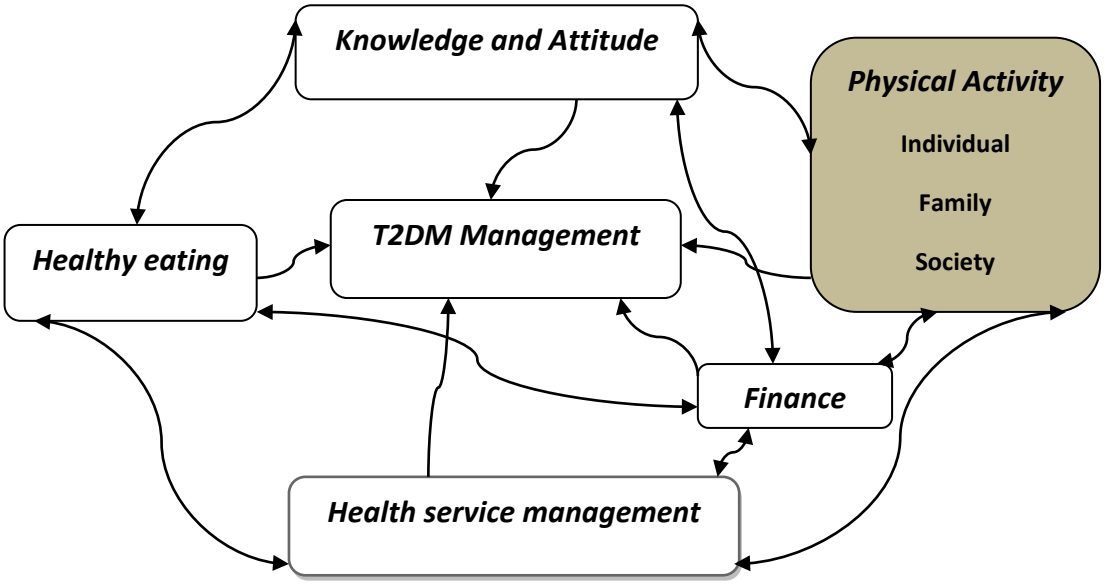


Figure 4.4 Influences of T2DM management among rural patients highlighting thetheme*physical activity*

4.2.1.3.1 Individual related influencers

Figure 4.4 reveals sub-themes related to *physical activity* among participants. The majority of participants were aware that regular exercise and adopting a healthy dietary key to effective management of T2DM. Participants discussed a range of benefits associated with *physical activity*; with some suggesting *physical activity* was part of their treatment program. For example:

> *Walking is a part of the medication and accepted by most patients as easy to practice*.(RP2-49 years)

Participants differed in the type of physical activity they participated in. Walking regularly either in a garden, street or nearby open area was the most preferred type of activity. Some of the patients considered the sports club as a better option where they can engage in a number of different sports activities. A few participants described malls as good places to walk. Some participants preferred gyms, however, gyms were not always located nearby patients' residences and moreover not everyone could afford going to the gyms due to high fees. Gyms could provide a variety of exercises other than walking. Younger people often had a busy

working life which meant attending the gym was often the most effective and easiest way of participating in *physical activity*. However, gyms are not widely available in rural areas and therefore walking in parks or other places was seen to be another option.

> *Gyms could present great benefit especially for obese and I never heard about discounted subscriptions*. (RP15-51 years)

> *Walking as sport is very important to diabetic as it improves patient temper and reduces blood-sugar level*. (RP9-47 years).

While other types of *physical activity*, including running, were discussed, participating in these activities was seen to be difficult because of the lack of time due to high workload, work timing or even the weather. RP 19 can support this:

> *It's very important part of cure and it may reduce blood-sugar levels. In my surrounding, I don't see lots of people practice running, and I think it's not a common habit due to weather and work timing*. (RP 19-51years).

4.2.1.3.2 Family related influencers

Participants discussed physical activities such as running, sporting events and gym.Some Participants suggested that family members generally supported participation in *physical activity* to help control their T2DM. The family members could give advice to the participants to undertake the *physical activity* as a method of management of T2DM. The majority of participants felt family members supported them to participate in physical activity.

> *My brother told me walking is very important to keep blood-sugar at low level.*(RP1-50 years)

The family members encourage walking, sporting and healthy eating. (RP3-46 years)

The participants further pressed that the family member could inform them on the recent advantages of the physical activity in management of the T2DM. The participants took the advice of the participants positively and this made them embrace walking to manage the T2DM. The participant informed me that he has been receiving advice from the brothers on how to manage the T2DM.

As far as I recently knew, diabetic has to practice walking, it's very important.(RP10-36 years)

Some family members also encouraged and joined participants in physical activity like walking and taking part in different games to support their management of T2DM.

The family joins me in the walks, different plays within the homestead

. (RP5-58 years)

4.2.1.3.3 Society related influencers

The community occasionally holds sporting events that aim to include all members of the community. The society members have a negative attitude towards the T2DM patients as they associate the disease with the family and the patients with T2DM are discriminated in community sporting events.

The society has a community sporting events which include community members but many participants avoid the T2DM patients. (RP14-50 years)

Despite the desire to participate in community sporting events, T2DM patients often feel discriminated against by members of the community. Many community members who suffer from T2DM do not help care for and support other T2DM patients during community events.

> *The community sporting day which is supposed to include all the members of the society but member of community avoided the T2DM patients (RP8-47 years)*

4.2.1.4 Health service management

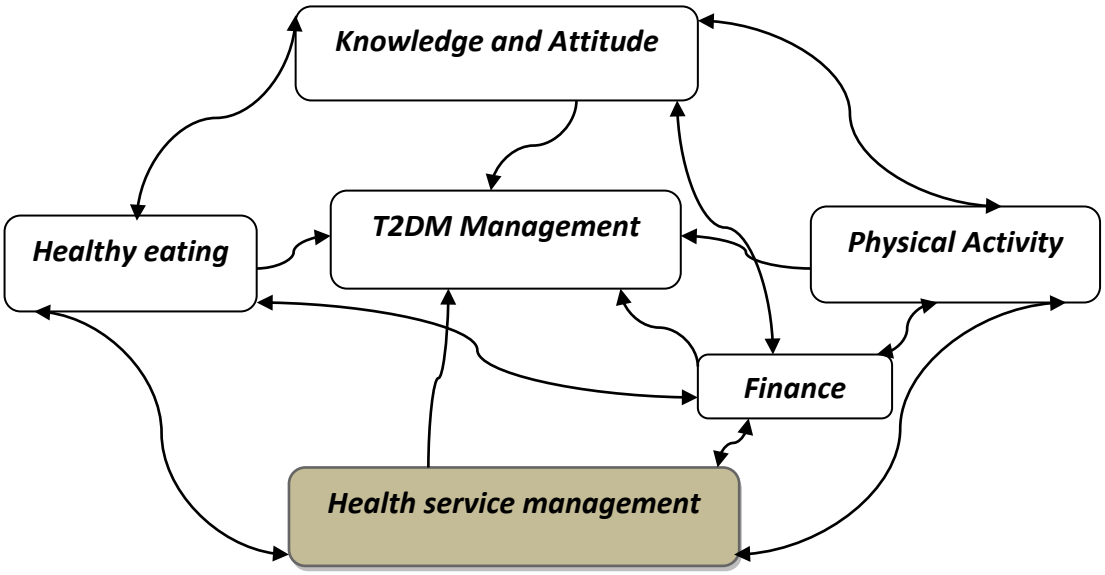


Figure 4.5 Influences of T2DM management among rural patients highlighting the theme health service management

Rural participants were concerned about the level of treatment and care available at rural health facilities (Figure 4.5). Some participants discussed negative attitudes among some health care providers when dealing withT2DM. These attitudes make rural patients reluctant to attend and to discuss strategies to maintain their T2DM. The following quote highlights these feelings:

> *Most members of the community discouraged to attend the local area since they have bad attitude toward people to T2DM disease.*(RP5-58 years)

In addition to poor attitudes there was discussion around the qualifications of HCPs employed in rural health care facilities. Some participants indicated that there were only general HCPs who had no specialized training on T2DM within the rural health facilities.

> *My neighbor would complain on the nature of the physicians treating within the health facilities especially when it comes to treating the T2DM.* (RP11-37 years)

Some participants in this study also indicated that community members had been advocating for better health facilities to be built in the area. In addition, while other health care providers were available they were not readily accessed. The majority of participants did not visit nutritionists after they left the health facilities. Most nutritionists are located within the health facilities and offer services to patients within the health facilities.The participants felt health facilities in the rural areas were not equipped with proper drugs and sufficient facilities to handle the T2DM condition.

> *Some medicines are available in health centers and others in hospitals, but long term regulator is not always available.*(RP7-61 years)

Therefore, some participants discussed family members advising patients in rural areas to visit urban health facilities for medical treatment. Some participants indicate that the family members believe that rural areas do not have sufficient medical facilities.

> *I was advised to usually visit the nearby city for my treatment.* (RP8-52 years)

Some participants also indicate that they have been advised by the family members that it was easy to travel to urban areas using public transport and the medical

facilities area were not congested making it easier to access health care providers and other health care service staff. In addition, the HCPs with expertise in managing and treating T2DM were easy to access in urban compared to rural areas. Many participants in this study preferred receiving treatment in urban areas.

> *The location of the urban areas is not very far from the rural area I live. I can be able to travel by public means where I access the medication.* (RP15-51)

> *My brother told me that the hospital in urban areas have enough physicians treating the T2DM.*(RP8-52 years)

Some participants indicated that as they continued to visit the hospital, they would be able to realise the association between the health services and the T2DM management.

> *Now after years of being diabetic and repetitive visits to clinics and discussions with physicians and nurses, I had known even more about it and the factors of heightening or lowering blood sugar level and the effect of sports on it.* (RP3-46 years)

4.2.1.5 Finance

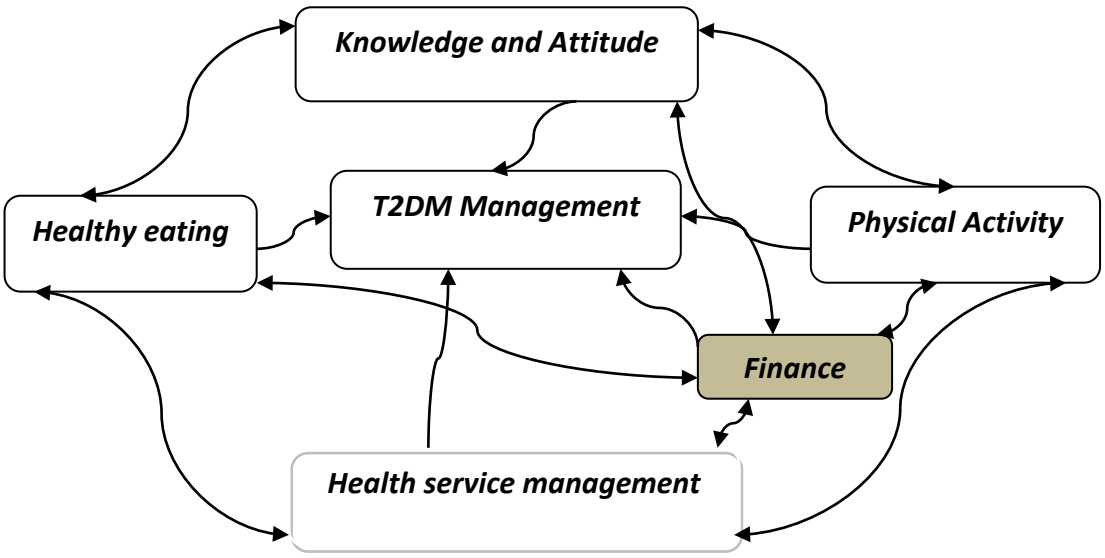


Figure 4.6 Influences of T2DM management among rural patients highlighting the theme finance

Finance emerged as an important influence in the management of T2DM (Figure 4.6). The management of T2DM is very expensive. This is because every aspect of the management has cost implication. The costs associated with maintaining a balanced diet, physical activity like the gym, and treatment of the disease.

Some participants suggested family members were influential in encouraging patients to adhere to medical treatment and were provided finance support by immediate family members.

> *My wife and children always provided me with money when I do not have which I use for medical purpose.*(RP4-35 years)

However, despite the emotional and finance support participants receive from their family members, after diagnosis some participants indicated that they stop their drug treatment due to finance reasons. The conventional treatment of T2DM is very expensive for the majority of patients and families living in rural areas. The *medication* concerning T2DM is provided free in the health facilities but in many cases, they are out of stock. This forces the patients to purchase drugs or seek other medical care alternatives at costly places.

> *Yes medicine is free in hospitals, but sometimes not all medicines are available.*(RP4-35 years)

This increased the burden, especially for a disease like T2DM which was likely to require treatment for many years. The finance ability of patients in rural areas constrained them from accessing quality medical treatment from well-equipped facilities.

Some participants, like RP3, personally received finance support from their family, enabling them access to good medical facilities. It was acknowledged that this was difficult in rural areas due to availability of services and associated costs:

> *Yes and my family helped me so much regarding diet and medicine, they also provide me with money when I want*

> *to go to the good medical facility because not all the patients can go to the best medical facility unless we have an access to main hospitals in urban areas, because the treatment is expensive.* (RP3-46 years)

Some participants found that the public hospitals have a small stock of insulin, which goes out of stock quickly. As such, in some instances the T2DM drugs are not available for the patients.

> *Some medicines are available in health centers and others in hospitals, but long-term regulator is not always available.*(RP9-47 years)

The majority of rural participants did not attend gyms as they are expensive and hence limited options found it difficult to access*physical activity* opportunities.

> *Gyms are expensive therefore I donot take the exercise there.*(RP17-57 years)

4.3 Urban patients

Twenty participants from urban areas were interviewed. This section will describe the findings of interviews of participants living within the urban areas.

4.3.1 The Demographic Characteristics of Urban Patients

The majority of urban participants (n = 7; 4%) had lived with their T2DM diagnosis for 1 to 5 years; followed by 30% (n = 6) participants who had lived with their diagnosis for 6-10 years.Table 4.2 describes the length of time participants had lived with their T2DM diagnosis.

Years of Diabetes	Frequency (urban)	Percentage
1-5 years	7	35
6-10 years	6	30
11- 15 years	5	25
above 16 years	2	10
Total	20	100

Table 4.2 Distribution of Urban participants based on the duration of T2DM

4.3.2 Influences of T2DM among urban patients

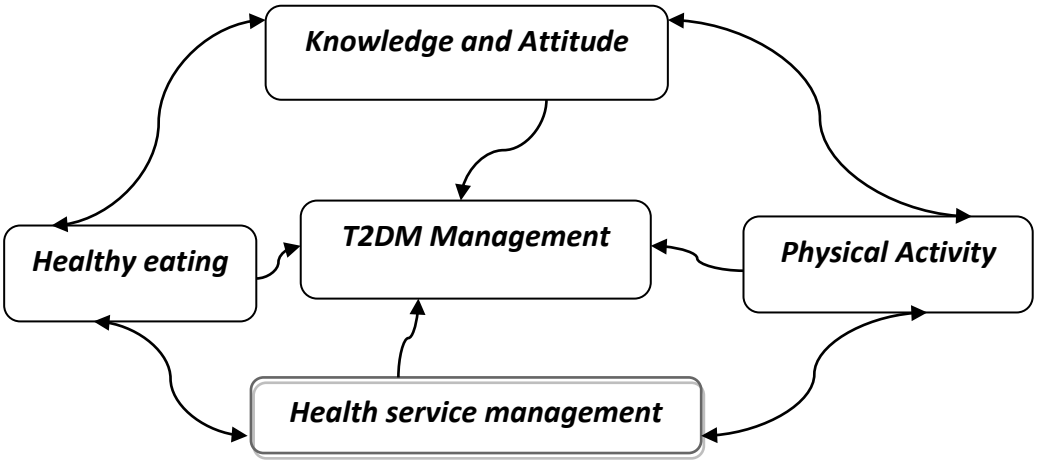


Figure 4.7 Influences of T2DM management among urban patients

The model describing influences of T2DM management among urban patients (Figure 4.7) includes the following themes: *knowledge and attitude*, *healthy eating*, health management, and *physical activity*. In contrast to the model describing the influences of T2DM management for rural participants the model describing urban influences did not include the theme *finance*. This may be because urban participants were middle income class (in KSA) and hence, they have money to care for their medical issues. The theme *knowledge and attitude*has an interaction with *healthy eating*, *physical activity, health service management* and T2DM management. Figure

4.7 describes the four key themes which emerged to help understand the influences on knowledge, attitudes and practices associated with self-management of T2DM among urban male patients. The model shows the interaction between the themes; the individual *knowledge and attitude* has an interaction with *healthy eating, the physical activity, health service management and T2DM management.* The theme of healthy eating interacts with that of health management, knowledge, and attitude. Also, the theme of *physical activity* relates to *health service management*, and *knowledge and attitude* and is similarly associated with T2DM management. The theme of *health service management* interacts with *healthy eating, physical activity*, and directly relates to *T2DM management.*

The *knowledge and attitude* theme included sub themes of individual, family and society. Similarly the themes of *healthy eating* and *physical activity* included sub themes of individual, family and society which help understand the different influences on T2DM management of these groups. *Health service management* also influenced T2DM management.

4.3.2.1 Knowledge and attitude

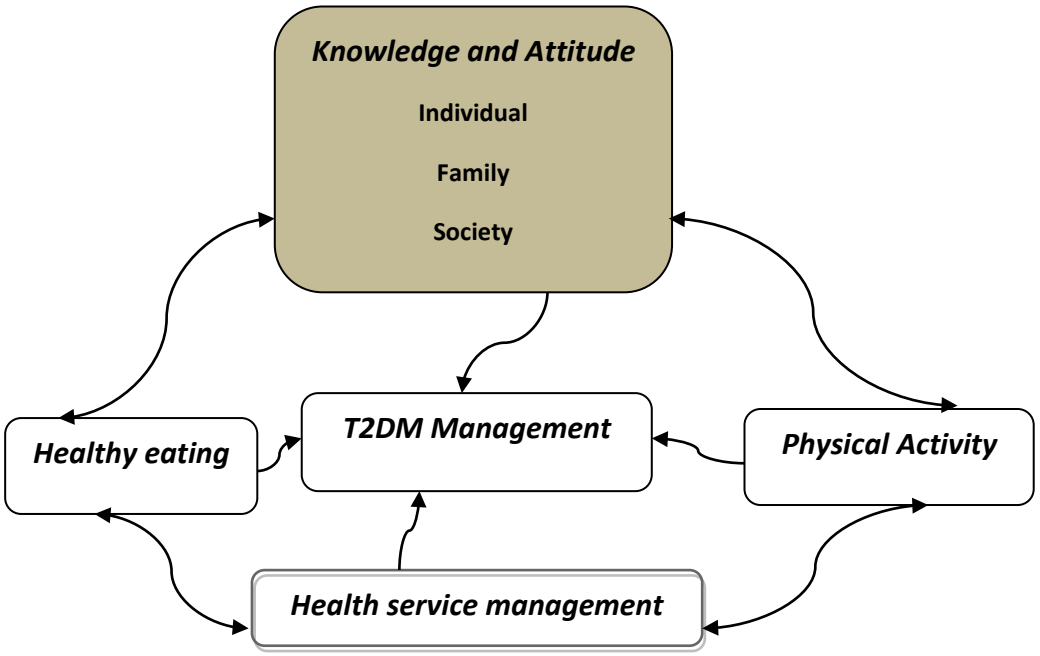


Figure 4.8 Influences of T2DM management among urban patients highlighting the theme knowledge and attitude

4.3.2.1.1 Individual

T2DM urban patients demonstrated sound knowledge regarding the causes, treatments and the care they should receive for their T2DM.Some of this knowledge was associated with the high prevalence of T2DM in their community, with many indicating awareness had increased as family members and friends were diabetics. This was highlighted by UP4;

> *While some of my brothers were diabetic, I learned too much about diabetes like symptoms and medications.*(UP 4- 37 years)

> And:

> *I had some information about it from diabetics around, after I recognized the disease, my knowledge about the disease and symptoms and medication had become greater.* (UP17- 40 years)

The majority of patients were aware that poor eating is a risk factor for T2DM. Urban patients were keen to seek and share knowledge about T2DM. Some patients were aware of the T2DM symptoms prior to diagnosis. This encouraged many of the participants to seek treatment at an early stage.

> *I knew through some readings of the symptoms like frequent urination, thirst as the major symptom of T2DM.*(UP1– 37 years)

Some participants also became aware of strategies to control T2DM through sharing information with friends and relatives.

> *I realized that I might be suffering from diabetics when we were discussing the disease with friends and found I possessed the symptoms that were mentioned, and this made me visit the hospital for a test.*(UP 14- 45 years)

Urban participants were aware that there are genetic risk factors associated with T2DM with the genes passed from parents to their offspring. Many discussed their awareness that their older relatives had the disease. The majority of patients openly discussed their T2DM condition and had accepted that T2DM is within their family lineage. According to UP 4:

> *I know much about it, besides my father has diabetes*.(UP 4- 37 years)

UP 2's comment reflects the general awareness of urban patients that T2DM is a genetic disease;

> *I was diagnosed as T2DM 2 years ago and As we know it's a genetic disease, and it's a fact we can see it clear whether parents or grandparents must be diabetics to be. My nephew although neither his parents nor grandparents are but the disease is genetic in his mother's family, and he got diabetes when he was 6 and the sugar is very high about 1200 as physicians say.*(UP 2-53 years).

Urban participants were open in disclosing their diagnosis of T2DM.

> *I didn't even try to hide it to any one especially when the symptoms had become clear on me. Diabetes had become common disease and known to everyone and is not considered a deformity. And I don't think diabetes affects the patient psychologically, it's just a disease needs medication like any other disease.*(UP 5- 65 years)

4.3.2.1.2 Family

Urban participants indicate that family members are also knowledgeable about T2DM. Participants discussed with their family members making the effort to acquire knowledge about T2DM which they share with the patients. Family members

made an effort in increased awareness of treatment, eating, and *physical activity* and the importance of managing T2DM.

> *As I heard it's due to stressful and not happy life and also the sweets and sugared foods.*(UP 20- 55 years)

Some patients also stated that the family members were aware of strategies associated with the prevention and control of T2DM.Participants discussed how some family members encouraged maintenance of T2DM through participation in sporting activities.

> *My brother always encouraged to undertake the sporting activities as he said this is one of the activities that is used to control the disease.*(UP 6- 59 years)

Furthermore, some participants also acknowledged that it was through their family members that they learnt that maintaining a healthy diet was another way that they could control the disease. Some agreed that balanced diets and eating a lot of sugar free food would help control T2DM.

> *My elder sister and mother always insisted that I should feed on balanced food with some fruit in them to control my condition*.(UP 12- 50 years)

4.3.2.1.3 Society

Urban patients suggested that societal attitudes towards T2DM were positive and there was little discrimination. People in the urban areas are more likely to be educated and are able to understand the medical condition of T2DM. This has impacted positive attitudes and the lack of discrimination in urban areas.

> *Community appreciates the situation of a diabetic and does not consider diabetes is a deformity.*(UP 8- 48 years)

Positive societal attitudes and lack of discrimination has meant participants are comfortable sharing their experiences with community members. Some participants

also suggested that the information and advice they receive from the community has helped them to maintain their condition and live a healthier life.

> *I have been advised by some friends within my neighborhood and this has helped me to take care of myself and live a comfortable life*.(UP 18-58 years)

> *Yes, I told them all, nothing to be hidden. Family is concerned by diabetes as common dangerous disease but doesn't consider it deformity.*(UP 5- 65 years)

4.3.2.2 Healthy eating

Overall, urban participants described positive attitudes toward patients with T2DMamong community members with participants being actively involved in community-based *physical activity*. Community members actively encouraged patients to participate in physical activity that involve the sporting as part of the management of T2DM. A few participants discussed participation in community sports days and indicated they were encouraged by neighbors to become involved.

> *The community invites everyone in the community sporting day without discriminating anyone.*(UP 17- 40 years)

> *Was requested to be part of the football team in the community day.*(UP 4- 37 years)

4.3.2.4 Health Service management

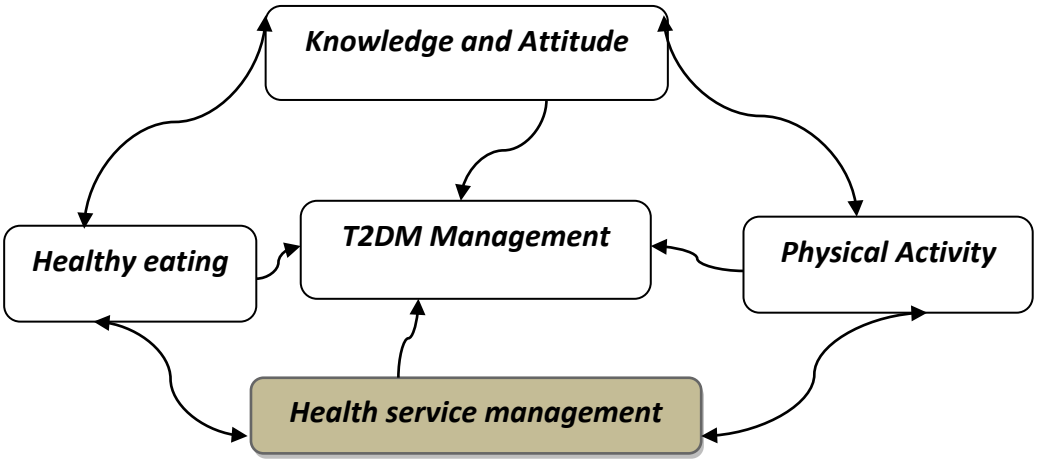


Figure 4.9 Influences of T2DM management among urban patients highlighting the theme health service management

The theme *health service management* did not include subthemes. The availability of well-equipped health facilities within the urban areas was acknowledged. In addition, it was acknowledged that the HCPs within these health care facilities are well trained and able to competently treat patients. Some participants were also aware of the health nutritionists who offer services on nutritional best practices. The majority of urban participants were also aware that the health facilities provide the most recent drug treatments for T2DM and associated conditions.

> *I think that Ministry Of Health is doing very well regarding providing medicines for diabetics and non-diabetics and providing devices for tests other needs to take care of patients.*(UP 13- 52 years)

Participants discussed receiving special care by their family members when they need it most. The majority were given special care by their wives, children and even parents when they need the T2DM care.

> *My wife occasionally accompanies me to the healthy facilities for checkup.*(UP 16- 48 years)

Some participants also indicated that most of the knowledge they have on control of T2DM has been acquired from family members who encouraged them that through careful management they could live a comfortable life.

> *"A lot of the knowledge I have on taking care of myself of T2DM I received from older family members.*(UP 4- 37 years)

The majority of participants were aware that the MoH has placed a lot of emphasis of treatment of diabetes. This has included funding for community-based awareness raising strategies implemented by community health workers. In addition, the MoH also funds affordable medical treatment through provision of free treatments in the hospitals.

> *Health ministry presents great care of diabetic regarding awareness and providing medicines for free.*(UP 15- 38 years)

Urban participants expressed faith in the services offered through the health facilities and the government. The MoH seminars enhanced awareness and those who had not been able to attend received information from others who had attended.

> *The ministry provide communication through media, magazines, publications and seminars to aware people about diabetes and its reasons, symptoms, and complications.*(UP 12- 50 years)

> *There are several drugs in the health facilities at cheap cost and the ministry has been providing awareness on T2DM.*(UP 14- 45 years)

> *Health Ministry can spread awareness through events and seminars in hospitals, schools, and universities where specialists can explain to the people everything about reasons, symptoms, and complications of diabetes.*(UP 9- 54 years)

The majority of the participants also receive advice on the quality of the services in different health facilities by the family members based on their past experience.

> *I was advised by my brother to attend a certain private hospital with specialized care on T2DM.*(UP 7- 62 years)

Some of participants have stated that they were allowed to see the HCP before other patients by the patients themselves in the hospitals. This has made them feel that they are appreciated by the community members and they are part of them.

> *I have at several instances been allowed to see the physician first by the other patients.*(UP 17- 40 years)

Due to this privilege by other patients, the participants in the urban areas have developed a positive attitude towards the management of T2DM. The majority of members of the community also encourage the patients in taking the treatment to the fullest at the nearest health facility.

4.4 Health Care Providers

This section will describe the influences of knowledge, attitude and practices regarding T2DM from the perceptions of the health care providers. Health care providers including physicians and nurses were interviewed in rural and urban areas. Themes include; *knowledge and attitude*, patient *acceptance of* T2DM, *healthy eating*, *self-care* of the patients, medication, attitude and support of family, *physical activity*, creating awareness/educating the public on T2DM.

4.4.1 The Demographic characteristics of Health Care Providers

Twenty health care providers were interviewed. Table 4.3 shows that majority of the health care providers had worked between 6 – 10 years which presented 40% of the total workforce. The distribution of the work force in both rural and urban areas is clearly indicated on table 4.3.

Years of Experience	Frequency (Physician)	Frequency (Nurses)	Percentage
1-5 years	2(10%)	3(15%)	25
6-10 years	4(20%)	4(20%)	40
11- 15 years	3(15%)	2(10%)	25
above 16 years	1(5%)	1(5%)	10
Total	10	10	100

Table 4.3 Distribution of health care providers based on the years of experience on T2DM

4.4.2 Health Care Providers

Figure 4.12 describes the eight themes that emerged to help understand the health care providers, including physicians and nurses, understanding of the patients in management of T2DM. Themes include; *knowledge and attitude*, *patient acceptance of T2DM*, *healthy eating*, *self-care* of the patients, *medication*, *attitude and support of family*, *physical activity* and creating *awareness/educating*the public on T2DM.The model shows the interaction between the themes *knowledge and attitude*, *awareness/education*, *healthy eating*, *physical activity*, *self-care* and *medication*. The double arrow connecting the themes indicates that there is interrelationship between any two themes. The *awareness/education* model indicates that it has an interrelationship with *physical activity*, *knowledge and attitude* and *healthy eating* on the management of the T2DM. The involvement of physical activity in management of T2DM depends on the level of awareness created among the participants. The *knowledge and attitude* of T2DM depends on the level of *awareness/education*. The theme of *healthy eating* clearly shows that the adoption of *healthy eating* in management of T2DM depends on the awareness and the knowledge of the participants. Finally, the T2DM management and treatment depends directly on the *self-care* and the *medication* themes in the analysis of the theme model.

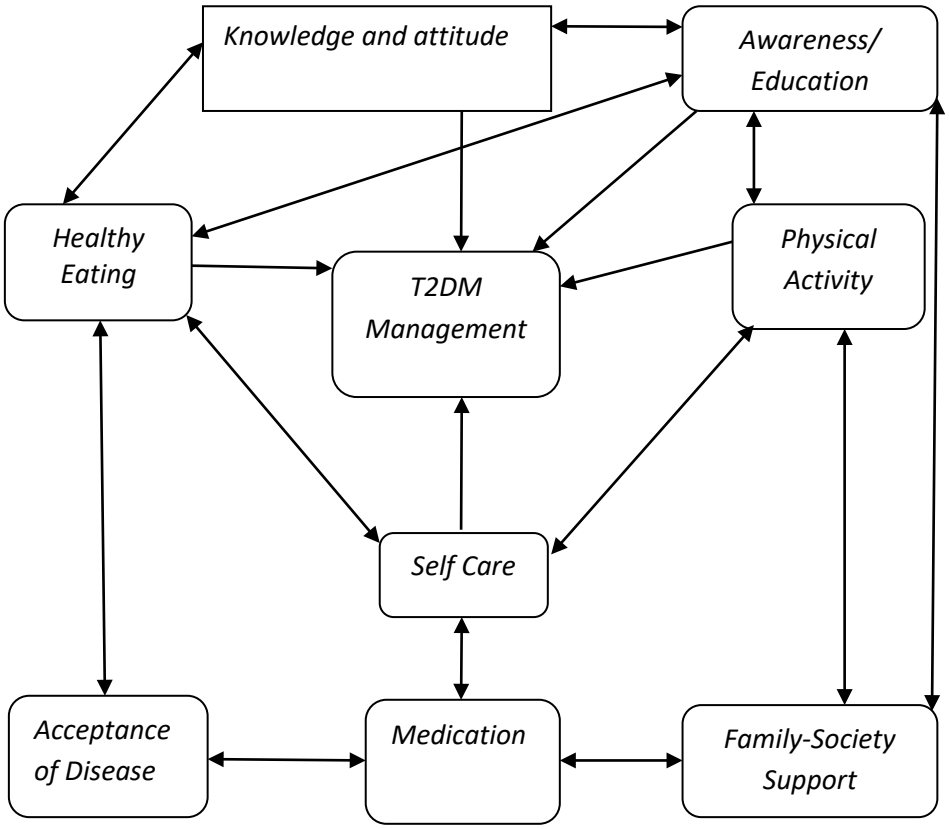


Figure 4.10 Health care providers perceptions of T2DM management among rural and urban males with T2DM

4.4.3 Knowledge and attitude related influencers

The majority of the health care providers (HCP) who participated in this study suggested that only a few rural T2DM patients who are diagnosed with T2DM demonstrated good knowledge of symptoms, prevention and maintenance strategies for T2DM. In comparison, knowledge was generally good among patients in urban areas. General awareness of T2DM was low in rural areas but high in urban areas.

> *The knowledge is smattering especially about symptoms*.
> (RHCP2).

According to health care providers, the majority of patients from rural areas were not aware that the key towards effective management of T2DM is regular exercise and adopting a healthy diet. The following comments from HCPs highlight the general lack of knowledge of patients:

There is little knowledge. (RHCP1)

For sorry, most of patients don't know much about diabetes. (RHCP2)

The analysis of the health providers found that the patients indicated that majority of the participants were not aware of the knowledge about *physical activity* and eating as a method of management of T2DM.

Most of patient don't know anything about diabetes just few of them know about symptoms. (RHCP4)

Urban patients were perceived to show good awareness of T2DM and the associated symptoms and maintenance.

Most of the patients are aware of diabetes and they know much about the symptoms.(UHCP1).

Most of the patients were aware that the disease can be control and you live for a long time.(UHCP2).

According to rural health care providers (RHCP), most patients were not aware that there is genetic predisposition to T2DM.

RHCP6 felt that few patients knew that offspring whose parents suffer from T2DM have higher risk of T2DM. The quotes below suggest that only 'about 5%' knew about the genetic transfer of T2DM from parents to children.

I think they are only 5%.But I didn't meet anyone whose family are all sound and he diabetic. (RHCP6).

Knowledge is very smattering and limited to what patient hears from relatives and friends. (RHCP8).

In contrast, RHCPs suggested most urban patients are likely to be aware of the diabetic condition within their family background. However RHCPs working in rural areas suggested most patients were not aware of the diabetic condition in the family background. They maintained that they were the first in their family to be diagnosed with the disease.

> *Though there were many patients who came for T2DM treatment, they had no information that the disease can have been passed from parent to the children within the family.*(RHCP6)

The majority of UHCP s indicated that the young generation knew the causes and also the preventive measures for T2DM, but they were ignorant in following them up since they want to enjoy themselves in their youth.

> *Yes, they know but still they do not take it seriously most of the time because they are young, and they want to enjoy their life, they do not care blood sugar readings, so at times the complications started and cause No1. for death in our country and the prevalence of diabetes.*(UHCP5)

4.4.4 Acceptance of T2DM

Health care providers felt the level of *acceptance of* T2DM diagnosis was low among both rural and urban patients. UHCP1's discussion highlights the perceptions of health care providers that most patients do not accept the condition.

> *Human nature whenever there's bad news there's always a reaction so it's very hard to cope with such a reality. But just like you mentioned, if there's a family history maybe in the back of the mind they would be mentally accepting that someday I would be having the same problem. In the beginning it's hard which is called the denial stage, despite telling you that you have this or that*

> *they won't accept it, they'll make excuses saying that maybe you've got the wrong file or maybe if you could have a recheck on everything. Despite doing all those tests, because we believe that whenever we break this kind of news to a patient we're quite sure based on the labs and clinical history. But yes, it is a difficult situation, but they have to acknowledge and accept that this is now the reality and they have to fight or cope with it.*(UHCP1)

RHCP in rural areas indicated that majority of patients do not accept that they may be suffering T2DM and reject their condition when diagnosed. They also fail to follow the advice given by the HCPs

> *"Most Saudi patients do not commit to physicians' advices"*. RHCP4 further adds that, *"some of the patients stop medication when they feel that they got well.*(RHCP4)

Similarly, UHCP working in urban health facilities indicated that most urban patients also did not accept the diabetic condition that they are experiencing.

> *Through my experience most patients have been receiving the news after diagnosis with a choke and with a lot of denial.*(UHCP4)

This indicates that from the HCPs' view, both the rural and urban patients do not accept being a T2DM patient. This is highlighted by RHCP7:

> "*It's very bad and hard news at the beginning, especially for young people in 20s or 30s*.(RHCP7)

4.4.5 Healthy eating

RHCP in rural areas have generally agreed there was a tendency to demonstrate dissonance around lifestyle behaviors, especially poor eating. RHCPs suggested the main influencers of T2DM were associated with poor diet and lack of *physical activity*. These perceptions are highlighted by the quotes of RHCP1 and RHCP2.

> *Obesity and consuming unhealthy foods rich in calories.*(RHCP1)

> *Lack of sports and obesity and consuming more fatty food*.(RHCP2)

UHCP4 discusses the importance of healthy lifestyle, however health care providers felt not all patients were able to maintain such a lifestyle. Health care providers felt urban patients often ate at restaurants due to their busy lives and in the words of UHCP4, 'life pressure'. UHCPs suggested urban patients were aware of the side effects of eating unhealthy, oily food from the restaurants, however hectic work schedules restricted them opting for healthy home cooked meals.

> *Majority of the patients confessed that they have been depending on food from hotels and restaurants despite being aware they are unhealthy due to tight work schedules.*(UHCP4)

As this statement of a RHCP points out, lifestyle changes are the major barriers in the path of diabetes control. When a person is detected with diabetes, suddenly a number of restrictions are imposed on him. These restrictions are mainly in terms of the food consumed, as patients are usually advised to reduce consumption of sweets and high carbohydrate foods to enable them to control their blood sugar levels. Foods with high cholesterol value include rice, potatoes, red-meat, and oil and spicy food. Seeing everyone else taking tasty delicacies, either outside the home or at home, makes it very difficult for patients to restrict consuming unhealthy food. These difficulties are highlighted by RHCP9:

Difficulties come from the new life style that diabetes would impose it as no more sweets but new eating habits.(RHCP9)

4.4.6 Self-care of T2DM

The majority of HCPs working in rural health facilities suggested that most patients did not know how to take care of themselves when diagnosed with T2DM. The majority of patients eat food rich in cholesterol, carbohydrates and sugar and few patients in rural areas attend physical activity programs. Similarly, RHCPs working in the rural areas felt few patients were aware of *self-care* programs when diagnosed with T2DM. From the analysis of the HCPs, few patients engage in *physical activity*.

"*From my experience of 10 years in the rural hospital working as a nurse, the patients have not been taking care for their health despite being diagnosed with T2DM. They do not actively involve themselves in physical exercise, and they also have not been eating health food.* (RHCP6)

"Inability of losing weight and practicing sports as they are not used to it.(RHCP10)

However, rural health care providers did attempt to encourage patients to control their T2DM through diet and *physical activity*.

If blood sugar isn't so high then we encourage the patient to control it through diet and sports.(RHCP7)

We advise the patients to be engaging in physical activities to manage their T2DMlevels. (RHCP8)

In contrast, the majority of HCPs working in urban health facilities suggested most patients are aware of *self-care* programs when they are detected with T2DM conditions. Most patients enroll in *physical activity* programs and adopt healthy diets, avoiding sugar rich food. HCPs working in urban centers also suggested most T2DM

patients were aware of *self-care* programs they should be involved with. Most of the patients involved themselves in sporting activities and adopted healthy diets.

> *Through my practice as a nurse in the urban hospital, the patients have been taking part in physical exercise, and attending gym sessions.*(UHCP6)

4.4.7 Medication related influencers

In contrast to the reports of some rural patients, HCPs suggested health facilities in rural areas store adequate supplies of *medication* for diabetic patients of the region.

> *During my service, I never observed unavailability of medication, and in very rare cases if some medicines are not available in hospitals, it would be available through private sector pharmacies.*(RHCP7)

> *Medicines are available all the time.*(RHCP8)

The majority of the RHCPs discussed the availability of two levels of drugs. Free drugs are provided in public health facilities while the private sector provides the same drugs at a cost. HCPs discussed there was always access to drugs, however there were sometimes shortages of the free drugs meaning patients needed to access drugs from the private sector.

> *It's rarely to have shortage of medicines as its always available.*(RHCP1)

Similarly, the public hospital in the urban areas provide free T2DM drugs which also sometime run out of stock due to high demand from the large population in the urban areas. However, due to thehuge numbers of private medical shops, the wait for the medicine is comparatively less than in the rural areas. It is stated by UHCP1:

> *"Being such a diverse country and a diverse culture, I think there is abundance of medications. There might be a few cases where you wouldn't be finding medications due to lack of stock or something that has not been*

approved by the FDA. Otherwise all the medications are up to date, available in every branch of Saudi Arabia.

Health care providers discussed the importance of patients taking their medications and working with HCPs to ensure dosages are correct. This is highlighted by UHCP5:

Getting the medication, taking the medication at the proper time, adjusting the doses and controlling the blood sugar is a major barrier in eradicating the disease. (URHCP15)

Alternative medicines include herbal dietary supplements that are available in the market and are marketed well by companies. These products sometimes provide money back guarantees if the medicine fails to lower their blood sugar levels. Despite they use a guarantee of money back as a way of marketing their products in actual sense they do not give back the money. Lack of awareness regarding the correct nature of diabetes and the appropriate curative measures is so common that the patients end up following incorrect treatment. According to RHCP1, some of the patients opt for alternative medicine which is herbal medicines. This usually happens with the rural patients and not in the urban areas.

It may be herbal mixtures or diet.(RHCP1) RHCP1 further adds*, "Instead of it, the patient resorts to the alternative medicine but in case of not finding a good result from it, he returns to us again.*

4.4.8 Family-Society support

RHCP perceived that the majority of patients from rural areas did not disclose their T2DM condition to family members. HCPs felt patients did not inform family members as they feared the T2DM condition might cause them to be rejected by the family members.

> *Most patients I deal with hide their sickness.*(RHCP19)
> He further adds, *"It is not a deformity, but the feeling is abnormal.*(RHCP19)

Similar to responses of some of the rural patients, families do not pay much attention to the care of the diabetic member in the family. HCP felt that the majority of the patients do not receive family members support. Therefore, the patients diagnosed with T2DM opt to keep their condition to themselves without disclosing.

In addition, health care providers also felt some patients, especially younger patients, were likely to hide their T2DM diagnosis from society. This might be due to the fear of not be included in social circles by friends. Diabetes is also considered as stigma in case of nuptial ties. That majority of the family members and the society stigmatize the patients who have openly disclosed their T2DM status.

> *Especially young patients hide their disease from the society.*(UHCP1)

In contrast, in urban areas, health care providers felt community residents' demonstrated broad-mindedness and more awareness of the disease. On asking one of the UHCPs whether a diabetic would want to detach from the society he replied:

> *I don't think I have ever come across something like that.*(UHCP2)

Similarly, when another UHCP was asked whether the diabetic believes that the community considers him to be abnormal, he straightforwardly answered,:

> *I do not agree with this.*(UHCP5)

Urban health care providers generally felt that society was supportive towards patients and hence patients felt included and were more engaged in society. This societal attitude boosts the morale of the patients, encourages management and reduces loneliness, all of which contribute to better mental health.

4.4.9 Physical activity

The majority of HCPs in urban areas indicated that the patients attend physical activity programs. Several HCPs working in urban health facilities indicated that majority of the patients are aware of the *self-care* programs when they are detected with T2DM conditions.

> *Majority of patients we talked with had a physical exercise program which they were attending.*(UHCP4)

However in contrast RHCPs, suggested that the majority of their patients do not engage in physical activity. RHCP suggested that rural patients do not engage in physical activity since they lack exposure. The lack of physical activity has led to accumulation of body fat and sugar leading to T2DM

> *Through my working experience in the rural areas, majority of the patients have not been engaging in physical activities.*(RHCP3)

> *Through many years of experience indicated that the patients in the rural areas have not been active in the physical activities. The patients have also not been exposed to different physical activities.* (RHCP5)

4.4.10 Education and T2DM awareness

HCP discussed the importance of rising of the awareness of T2DM to enhance the management of T2DM. Awareness programs will help increase knowledge about T2DM and may help others to prevent the disease. HCPs are of the view that there should be different awareness programs about the disease, causes, symptomsand prevention andconsequences. This is because education is the most important requirement for the prevention of T2DM as educated people help the HCPsprovide correct treatment. It is important to change the food consumption habits of the patients and engage in different sports and other physical activity.

Most of the UHCPstated that the MoH needs to enhance the awareness education on T2DM. The education can focus on the prevention, *healthy eating* and physical activity as an after care, and *medication*.

> *"For the Ministry of Health what I would recommend or what I would suggest that they should make this more aware in the community by giving the proper education on every level. Which should be primary, secondary and tertiary so that every group of people whether they are educated or non-educated should be coming across the situation and they should know what exactly it is. What it signifies in their life, what are the interventions that can be done and what are the advantages and disadvantages if they don't comply with the situation. So keeping a close contact, building a nice established relationship between physicians and a patient would overcome so many barriers that it would overall improve the mortality rate from this disease since the drugs are available in all the health centers"*(UHCP1)

The majority of patients lack awareness on healthy fitness activities as the primary cause of accumulation of body fat, which leads to obesity and culminates into diabetes. Obese people feel lazy and lack the urge to move. They prefer vehicles when travelling even a short distance.

> *The big difficulty is the society that needs health education to support patients besides the weather in our country which make it hard to walk or run.*(RHCP10)

This is however a major barrier as lack of awareness has resulted in a number of myths and false treatment techniques that should be avoided by a diabetic to lead a healthy life.

4.4.11 Summary

In summary, there were distinct differences between the knowledge of those living in urban areas versus those in rural areas. Patients from urban areas had higher levels of knowledge about the signs and symptoms of T2DM along with greater knowledge of the importance of physical activity, and healthy eating. Hospitals and clinics in urban areas were more likely to be well equipped with necessary medications. Rural clinics and hospitals that were less equipped with the necessary medications and financial support of the patient was a bigger issue.

Chapter 5 Discussion

5.1 Introduction

This chapter will discuss the key themes associated with the theoretical models which describe influences of T2DM managementamong urban and rural males from Riyadh, Saudi Arabia. The findings will be compared with current literature and will help inform the provision of health care services, particularly for male T2DM patients in rural and urban Saudi Arabia. This chapter also explores barriers and enablers associated with the management of T2DM identified by male T2DM patients. No studies exist in terms of knowledge, attitude and practice and management perception of diabetic people in rural and urban areas in KSA. The trainagualtion of data from urban and rural males in addition to health care providers strengthens this study.

5.2 Theoretical Model

The study has developed three theoretical models based on the research findings. The theoretical models describe influences of T2DM management among urban and rural males from Riyadh, Saudi Arabia. While similar, two separate models were developed to hightlight subtel differences between rural and urban T2DM male patients. In addition, a third model was developed to help understand the preceptions of health care providers on T2DM management among their male patients.

Participants shared their experiences and perspectives, which guided the development of the models. Various factors are attributed to the rapid increase in T2DM prevalence in China, including socio-cultural changes, unhealthy behaviours, dietary changes, urbanization, ageing populationsand a significant decline in physical activity (Wu, 2014).

Influences of T2DM management among male urban patients in this study included *knowledge and attitude*, *healthy eating*, *physical activity* and *health service management*. The same themes emerges to understand infleunces of T2DM management for rural patients, however this group also discussed *finance* as playing

an importantrole in management. Health care providers were also asked about their perceptions of how their urban and rural patients managed T2DM. Similary health care providers also highlighted the influenceof *knowledge and attitude*, *healthy eating* and *physical activity*. Additional themes which emerged to explain health care providers perceptions included: *awareness and education*; *self care*; *acceptance of the disease*; *medication*; and *family and society*.

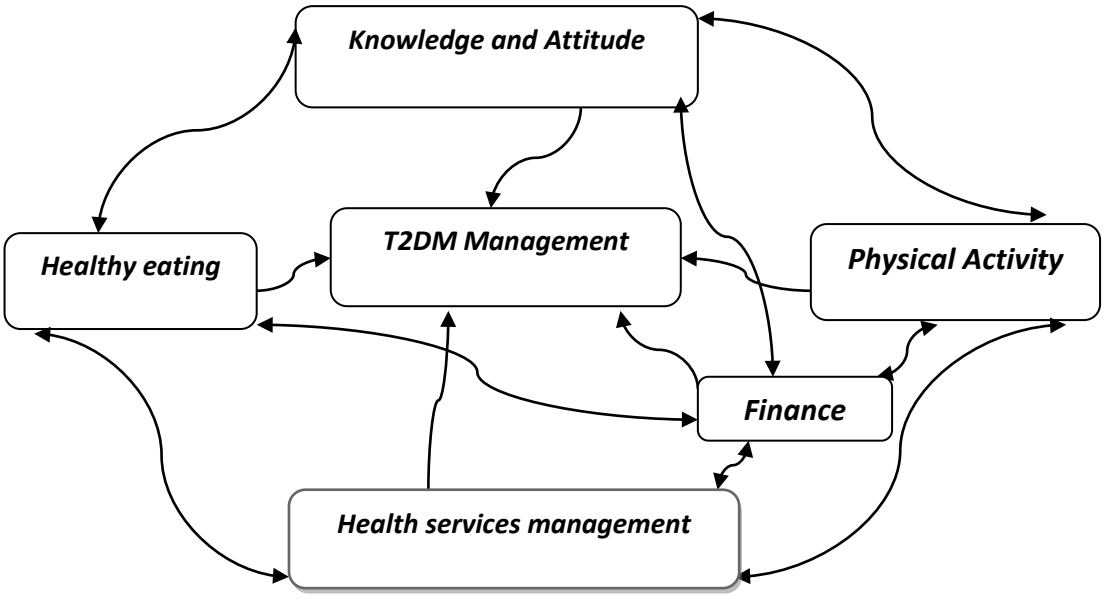


Figure 5.1 Influences of T2DM management among rural patients

5.3 Discussion of Research Objectives

5.3.1 To Explore Knowledge and Attitudes of Male T2DM patients from the KSA about Prevention and Management of T2DM

5.3.1.1 Research Objective 1

The first research objective of this study was to explore knowledge and attitudes of male T2DM patients from theKSA about prevention and management ofT2DM. Several studies have explored knowledge, attitudeandpractises associated with the management of T2DMglobally. However, there are limited studies focusing on Knowledge, Attitude and Practises (KAP) of diabetes complications, prevention and management amongst T2DM patients of the KSA (Murad et al., 2014; Midhet et al., 2010; Badedi et al., 2016). All three studies are within Saudi Arabia. The

theoretical model developed from the findings of this study identified five key themes that explain the influences of management of T2DM among rural patientsand four key themes to explain infleunces among urban patientsin Riyadh, Saudi Arabia. *Knowledge and attitudes*, *healthy eating*, *physical activity*, *health services management*and*finance* emerged as key themes describing influences of T2DM management among rural patients, while *knowledge and attitudes*, *healthy eating,physical activity*and *health services management* describe influences of T2DM management among urban patients. Health care providers also highlighted the influence of *knowledge and attitude*, *healthy eating* and *physical activity*in addition to: *awareness and education*; *self care*; *acceptance of the disease*; *medication*; and *family and society*on T2DM management.

The findings of this study suggest that most urban participants had good knowledge about T2DM management and prevention, while in rural areas there was a lower level of knowledge and awareness among participants. These findings are similar to a study by Abuyassin&Laher (2016) in rural North Africa and Middle Eastern rural areas. According to Uthman, et al. (2015), a study conducted to assess the KAP levels among Pakistani people (n = 250) reported poor knowledge and practises towards T2DM and suggested a better knowledge of T2DM management is required in promoting care and increasing good remedial outcomes. Surprisingly, only a few rural participants in the current study were concerned about potential causes and symptoms and visited hospital to be checked for T2DM before they were diagnosed. In terms of knowledge, very few rural participants exhibited good knowledge of T2DM, including knowledge of the name of the disease, causes and symptoms, before their diagnosis. Factors like dietary habits and modern lifestyle are likely to increase risk factors for T2DM among Saudi people compared to other populationsdue to the rapid urbanisation of the country (Alharbi, et al 2014). Awareness and education of people with T2DM are considered to be more effective if health care organisations and governments understand the level of knowledge, attitudeand practice in addition to prevention and management of T2DM(Al-Quwaidhi et al., 2014). Proper dietary practises are a fundamental and essential part of treating and recuperating risk factors and medical and metabolic effects, therefore increasing the quality of life (Alajlan, 2007). For that reason, culturally appropriate education and awareness programs could enhance the knowledge of patients and

transform their attitude and nutritional practises. Research from Pakistan emphasised the point that appropriate education and awareness programs would possibly progress the knowledge of patients and transform their attitude (Shera, et al 2002).

Malaysian research found good knowledge and practice of people diagnosed with diabetes (Ambigapathy, et al 2003). The differences between the two countries (Malysia and Saudi Arabia) might be because of variances of literacy rate, knowledge and information about diabetes. Education through sessions at every visit is likely to be more efficient if health care centres are familiar with the characteristics of the patients with regards to knowledge, their attitude and practises about prevention of T2DM (Uthman, et al 2015). In their study, Rahaman, et al (2017) found males to be more knowledgeable about healthy lifestyles than females in Bangladesh. However, Haque et al. (2009) found no significant differences among knowledge of genders in Bangladesh.In this study knowledge was better among urban compared to rural participants, althoughhealth care providers perceived there to be a need to improve knowledge of all patients. Participants in this study did however discuss the varying level of services among rural and urban areas with urban health care facilitiesproviding more extensive levels of care and education. Educational programs have been found to enhance knowledge of T2DM among patients (Rahman, et al 2017).

There is growing evidence that patient education is the most efficient means to reduce the complications of diabetes and increases prevention management (Shah, et al., 2009). As it is important to explore HCPs' perspectives in terms of knowledge and attitude, the current study included HCPs in order to understand their perceptions. Nurses and the physician's from rural areas indicated that the level of awareness was low and the patient's perception was low in management of T2DM. In contrast, the HCPs in the urban areas indicated that patients had high perception of the management of T2DM. To some extent, as a consequence of changing patterns of food consumption in response to lifestyle factors, diabetes has developed as an epidemic health problem across the Kingdom. Increased food portion sizeand extensive increases in consumption of fast foods have resulted in the increased occurrence of obesity, a riskfactor associated with T2DM. Physical activity as a part of lifestyle is not included in most of the populations' routine activities (Badedi, et

al, 2016). In this study health care providers suggested that very few rural T2DM patients were aware of T2DM prior to their diagnosis and exhibited poor knowledge of prevention and management strategies for T2DM. In addition, participants demonstrated poor knowledge of prevention strategies such as healthy diet and physical activity.

Comparatively, knowledge was much better among T2DM patients in urban areas. General awareness of T2DM is comparatively low in rural areas than that of urban areas (Midhet, et al 2010). The report from World Council of Optometry (2004), found that most rural diabetic patients remain undiagnosed. Delayed diagnosis and poor or irregular treatment is likely to result in poor disease outcome (Samuels, et al 2007). Although the prevalence of T2DM in the Saudi population is high, patients are more likely to lack knowledge about T2DM and the management of their condition (Saadia, et al 2010). Poor knowledge of proper diabetes education, management and awareness programs in rural regions in Saudi Arabia worsens gaps in knowledge and insufficiencies in compliance, as well builds incompetence in self-management. Diabetes medication and adherence is an important barrier toward accomplishing positive treatment effects (Abdulmageed et al., 2014).

Patient understanding, such as knowledge, beliefsand behaviours, was identified by participants as the major factor that hinders treatment and management in T2DM.HCPs' knowledge and attitudes towards the management of T2DM is likely to impact how they work with patients to help manage their T2DM.This study contributesto the current literature through exploring the views of HCPs' perspective on management and awareness of T2DM, particularly on the causes and means to resolve the problem in the KSA context. Health care providersperceptions are useful toinform appropriate interventions to increase adherence and effects of treatment on T2DM. Overall, the health care providers in this research indicated that patients have inadequate knowledge regarding diabetes and its outcomes and therefore have been educating patients on T2DM when they visit the hospitals for treatment

The findings from health care providers in this study suggest the majority of patients from rural areas are not aware that the effective management of T2DM includes regular exercise and having a healthy diet. Rural T2DM patients are far less informed in terms of T2DM, its management and its critical outcomes. In

consequence, there is a pressing demand to progress the awareness level of T2DM in rural regions.

The importance of physical activity, amongst other treatment therapies, is constructive in precluding or delaying the arrival of T2DM (Burr, et al 2010). The current research emphasized that rural participants are largely unaware of physical activity and nutrition as a method of management of T2DM. However, it is contrary to the results of Al-Nozha, et al. (2004), in which the findings reported that the potential causes to explain lower occurrence of T2DM in the southern region is possibly a result of more individuals inhabiting rural areas with increased physical activity and minimal rates of obesity. The basic values of an efficient exercise program are the strength, duration and regularity of exercise in a proper environment.Most participants recognised the importance of regular physical activity in retaining good health and controlling T2DM and have discussed adopting various physical activities. For decades, physical activity has been considered a keystone of diabetes management, in conjunction with diet and medicine (Sigal, 2005).More comprehensively, physical activity has an important role in improving insulin action, metabolic functions, prevents complications of diabetics and intensifies life expectancy of the patients (Dewan, 2007).Thus, it is essential to increase awareness of the importance of physical activity to enhance prevention and management of T2DM in rural areas. It is also important to educate society to increase the acceptance of patients in rural areas so the patient can participate in community physical activities without discrimination.

Past research has indicated that T2DM is also passed genetically from parents to their children (Midhet et al., 2010). Despite this, health care providers participating in the current study reported that rural patients are not aware that there is a genetic predisposition to T2DM. In contrast, health care providers working in urban areas suggested most urban patients are likely to be aware of the diabetic condition within their family background. Having positive family history of T2DM also has a positive effect on patient's attitude and practice, while it is not linked with knowledge (Al-Maskari, et al 2013). In the current study, in terms of awareness, urban participants were aware that there are genetic risk factors associated with T2DM with the genes passed from parents to their offspring. Many discussed their

awareness and disclosed that their older relatives had the disease.However, health care providers suggested rural patients were less likely to knowthat T2DM can be passed from the parent to the children and only 5% knew about the genetic transfer of T2DM from parents to children.

5.3.1.1.1 Individual related influencers

The theme *Knowledge and attitude* includes sub-themes of *individual*, *family* and *society*, as well. The sub-theme *individual* depicts how knowledge and attitudes of individuals influence management of their T2DM. The prevalence of T2DM is increasing worldwide and creates an intense burden on health and socioeconomic progression of all countriesand Saudi Arabia is not an exception (Alqurashi, et al 2011). The development of T2DM included a range of contributing factors and is also caused by a blend of individual and hereditary risk factors. Several individual risk factors play an important role in the pathogenesis of T2DM, including lifestyles, for example, deskbound behaviour, dietary behaviour, smoking and intake of alcohol (Kirsten &Karch, 2012). Most rural participants in the current study exhibited poor levels of awareness in terms of the specific symptoms and effects of T2DM prior to their diagnosis. Similarly, very few participants seemed concerned about their symptoms before diagnosis. Most rural participants did not take good care of their health because of poor knowledge about T2DM. Only after diagnosis did awareness increase, with study participants beginning to discuss and share information about T2DM symptoms, prevention and maintenance behaviours like physical activity, diet and reduced stress. Health care providers felt the level of acceptance of T2DM diagnosis was low among both rural and urban patients.Urban patients were likely to look for and share knowledge about T2DM. Some patients appeared to be familiar with T2DM symptoms prior to diagnosis. However, this was not occurring among rural patients and only after diagnosis did awareness levelsincrease slightly.

As a result of the subtle nature of this disorder many people continue to be undiagnosed until complications become severe (Abdelhafiz, 2013). Also, inadequate care at the initial phase of development negatively affects the patient's quality of life. In nearly all developing countries diabetes is the most important cause of cardiovascular disease, loss of sight, kidney impairment and lower limb amputation

(IDF, 2015). Essential interventions must be put in place or the expense of care for T2DM patients will have an unconstructive effect on the health care system, as recommended by professionals.

Many measures have already been employed to instruct people with diabetes on how to reduce the problems; however, these measures have not been taken seriously by the T2DM patients (Rahaman et al., 2017). The current study shows contrary results and some participants felt that after T2DM diagnosis, their knowledge about the disease increased once they received information from HCPs. However, even with increased awareness, some participants revealed that they consume unhealthy foods like fast food products, which eventually put their T2DM diagnosis at risk. Slight changes in people's lifestyle could reduce the probability of being affected by this disease to a great extent (Midhet et al., 2010). Consequently, with the intention of preventing this condition, actions must be implemented in terms of the adaptable factors that impact its development, such as lifestyle and nutritional habits (Midhet et al., 2010). Nevertheless, with appropriate testing, management and changes in standard of living, including healthy eating and physical activities, positive impacts on individual health and preclusion or management of diabetes, promoting adherence to this structure is of substantial public wellbeing and importance (Asif, 2014). Diet is obviously one of the most important factors associated with an extensive range of diseases and diabetes is not an exception (Steyn, 2004). Diet represents a critical phase of the general management of diabetes, which might entail diet alone, food control with oral hypoglycaemic medications, or diet with insulin (Steyn, 2004). Some urban participants reported that their family members and relatives advised them to follow healthy, balanced diets. However, rural participants were less likely to be encouraged and supported by family members to eat a healthy diet.

The positive health performances of physical activities are well documented in the avoidance of diabetes in persons at high risk and in the treatment of T2DM (Zinman et al., 2004). Most of the urban participants in this study visited the gym regularly, which was not the case of rural participants. Some participants from urban areas indicated the knowledge they have in regard to the importance of physical activity in the management of their T2DM condition has encouraged them to be more physically active. Similarly, others have also found physical activity can be a healing

tool in various patients with T2DM (Dewan, 2007). Recent studies have exhibited that increased physical activity, along with dietary changes, could prevent persons heading towards diabetes (Dewan, 2007).

Physical activity promotion should be given as equal importance to advice in terms of diet and treatment by the diabetes health care institutions. Accordingly, it is important to carry out numerous researches in order that individuals with diabetes can gain access to information and advice, which will facilitate them to develop routine physical activity into their lifestyle.

5.3.1.1.2 Family related influencers

Fisher et al. (2000) stated that family members may have effects that are either positive, negative or both on health of individuals with diabetes. This supports research by Scheurer (2012), which states that better social support has been related to increased health outcomes and improved behaviour. In the current study it was found that most participants from urban areas received positive support from family members, giving the patient a good attitude towards the management of T2DM and leading them to a more positive outlook on life, compared to the rural participants.Diabetes mellitus (DM) care requires efficient self-management education and assistance for both patients and family members. In general, family support is considered to have a positive effect on healthy patterns of eating, improved perceived support, better self-efficacy, enhanced psychological health and glycaemic control (Pamungkas, 2017).

Family support is likely to increase self-management behaviours and health effects among T2DM patients (Tabasi et al. 2014). In the current study, the majority of urban participants reported family members offered support and provided information, especially around healthy food. The majority of participants suggested that receiving encouragement and support from family members encouraged them to seek their T2DM diagnosis. However, rural participants were less likely to share their problems with their blood relatives and other family members. Rural participants reported the social stigma associated with T2DM. Pamungkas,(2017) suggested diabetes mellitus self-management education (DSME) that integrates family engagement could be positive in enhancing diabetes care. Poor knowledge,

minimal levels of self-effectiveness to efficiently carry out an activityand inadequate societal support from family members has been linked with inadequate diabetes self-management (Miller et al. 2013). Several studies emphasised that family support has a constructive impact on patients' self-management actions (Miller et al. 2013; Wagner et al. 2001).

Interpersonal relationships within families and within the broader social context are likely to influence an individual's diabetes management. Family members are considered to be influential in lifestyle choices as well as providing emotional support (Pamungkas, 2017). Both instrumental and emotional support contributes to T2DM patients' wellbeing. Instrument support includes assisting individuals' complete specific errands, for example getting an appointment with health care institutions or helping with particular injections and treatment, while emotional support includes providing comfort and support when patients experience distress or annoyance over the long path of their diabetes care (Pamungkas, 2017). Urban participants agreed that the majority of family members are aware of the importance of physical activities for patients with T2DM. Some participants indicated that family members are more likely to encourage them to be involved and actively engage in physical activities such as working-out at the gym and participation in other sports. It is evident in the current study that family members are quite supportive and often join in various activities. The findings of the current study reported that the influence of the family could have a diabetes care guiding principle integrate the specification of diabetes education to family members or integrate family support as part of the individuals' diabetes care plan.

Research by "DiMatteo and Miller (2013)" emphasised that support from family endorses conformity through self-respect and optimism whichreduce negative feelings of being ill and lessen patient depression. Patients' family and friends could show support in overcoming obstacles in carrying out diabetes self-management, however attitudes of members of family also have potential to be destructive (Vaccaro et al., 2014). The structure of family unit and the family's attitude and skills in managing T2DM could further aggravate the pressures related to diabetes management (Vaccaro et al., 2014). The lifestyle changes needed for best possible diabetes self-management frequently contradict established regular family practises (Baig, 2014). For example, self-management of T2DM is likely to involve modifying

the types of food prepared and consumed at home, in addition to reprioritisation of family funds, all which might have an effect on family routines and dynamics. Family members might disrupt or weaken patients' self-care attempts by planning unhealthy meals, tempting them to consume unhealthy foods, or inquiring the demand for medicines (Mayberry and Osborn, 2012). One study found that pressure from a partner in terms of a patient's diet is related with increased diabetes-specific distress amongst individuals with T2DM (Stephens et al., 2013). A family's obtrusive behaviours might be more destructive amongst adults with inadequate health literacy and individuals who are facing other stressors or critical depressive symptoms (Tabasi, 2014). Therefore, diabetes self-management must concentrate not simply on the individual patient, but on the whole family, in order for them to be better prepared to confidently encourage their family members with T2DM.

5.3.1.1.3 Society related influencers

Beyond factors such as consuming nutritional food, keeping active and adopting medication processes, the emotional and psychological implications are important to consider (Asif, 2014). Many studies recommend holistic or practical methods to help people with T2DM cope with mental health issues (Asif, 2014; Ofori and Unachukwu, 2014). People with T2DM need support from family and society, including a patient-centred mutual approach to endorse self-care endeavours, knowledge, education, treatment management and empowerment (Rad, 2013). However, until recently initiatives to support patients with T2DM and health care providers to accomplish these skills have fundamentally been isolated, which eventually leads to delayed adaptations and commitment towards self-care (Abrahim, 2011). Further, people with T2DM experience challenges such as support from the whole society. Factors related with effective self-management performance include social and community support, increased self-efficacyand good psychosomatic status (Rad et al., 2013). In addition, low cost self-management practises for people with financial problems can provide solutions to patients with T2DM (Carcone et al., 2011).Similar studies have shown that there has been important positive linkage between management of diabetes and social supportamong patients (Miller and DiMatteo, 2013). Social support provides T2DM patients with practical assistance and it could lessen the pressures of coping with the disease.Nevertheless,a proper

mechanism through which social supportinfluences management towards diabetesis yet to be explained.This therefore neccesitates researchon how differences in types of support, such as family or social support, are linkedtoend results for patients. Patients' potential to respond to T2DMmanagement control, regularly occurs in social set-ups and may have impact on family and social dynamics (Miller, 2013). Whilst social support could have an effect on the capability to regulate andcope with sickness, some empirical researchhas shown contradicting results, with indications that social supportmay forman important obstacle to patients' self-management (Gherman, et al 2011; Lewandowski, et al 2007).The degree to which health effects and adherence to management of diabetes is influenced by social support have crucialeffecton both policiesand practices (Song, 2017).Some participants indicated that most of their knowledge about the management of T2DM had been acquired from family members who encouraged them that through careful management they could live a comfortable life. Experiencing chronic complications of T2DM results in lower life expectancy and increase in loss of life, entails increased finance burden on the individual, familyand societyand influences the life quality of the patients and his/her family (Leal, 2009). Studies have shown that those with T2DM have a shorter life-expectancy than non-diabetic persons and that this additional mortality is fundamentally caused by cardiovascular causes (Leal, 2009). The medication concerning T2DM in the rural Saudi region is provided free from health facilities but in many cases, they are out of stock, which forces the patients to purchase drugs or seek other medical care alternatives from very costly places. This increased patients' perception of the burden, especially for a disease like T2DM which was likely to require treatment for many years. The financial ability of patients in rural areas constrained them from accessing quality medical treatment from well-equipped facilities.

Consequently, many studies reported T2DM (Anderson and Funnell, 2005) is a disease that generates fear among patients and their close family members. The progression of a personalised plan for individuals with diabetes will facilitate better interrelationships with health care providers and partner/family members to establish a plan to enhance self-management. This could enhance their self-sufficiency, knowledge, self-management and various coping strategies (Heiser, 2005).

As T2DM is a chronic disease which requires behavioural changes and commitment to a complex diet, social support is regarded as one of the most influential and significant factors for self-care and for commitment to treatment, management and disease control,which make the patients with disease (Trief et al., 2007). Conversely, the most important part of the care for this disorder is carried out at home and within the family boundary (Shaw et al., 2006). Hence, diabetes is at times called a family disease on account of its control and demands affecting all family members (Greca et al., 2002). In consequence, social support, particularly family support, is an imperative aspect in the successful control of T2DM. As identified by urban participants in this study, positive societal attitudes and avoidance of hatred has facilitated sharing their diagnosis and management strategies freely with community members. Some urban participants suggested that the information and guidance they receive from the community has helped them accept their diagnosis and has supported their efforts to achieve a healthier life. The findings of the current study highlight the different perceptions of rural and urban patients. Urban patients in this study suggested that societal attitudes towards T2DM patients are positive and they feel little discrimination. This might be because people in the urban areas are more likely to be well-informed in terms of the medical condition of T2DM. This has impacted positive attitudes and the lack discrimination in urban areas. Most of the previous studies focused on inherent factors that have effect on adherence behaviours (Shao, 2017). Effect on adherence to diabetes management on patientby social effect was one of the factors identified. A study by Dereca et al. reported that support from family was most ideal in predicting good management among patients withT2DM. Most concepts of health and behaviour change requires family support which is the pivotal social support as an important source of encouragement (Kang et al., 2012; Mayberry et al., 2012). A number of studies haveidenfiedfamily support as an intervention training adults on management of diabetes. Research that describes integrated familial support suggests findings are potential, though somewhat incompatible. For instance, in a study carried out by Mayberry and Osborn (2012), awareness about diabetes and family and social support programs had been employed to support aged patients with diabetes with problems on sticking to dietary restrictions.

The training module of diabetes, for family and society support, has specific goals which include to educate affected people regarding managing and living with diabetes; to establish solutions and methods for healthy food; and enhancing supportive relationship between family members and the patients to ensure longterm maintenance of dietary adherence (Mayberry and Osborn 2012).As emphasised by one of the researchers,patients involved in training programs had reduced glucose levels in their blood and were doing well in adherence for up to 6 months after the completion of the training program

5.3.2 To explore self-care practices among male T2DM patients from KSA

5.3.2.1 Research Objective 2

The second objective was to assess the self-care management of T2DM patients. The current high T2DM frequency ratios amongst population in the KSA are suggestive of the lack of efficient preventive and self-care measures (Johani, 2015). Health care providers reported that only few patients engaged in physical activities. Findings of this study emphasised that most rural patients were more likely to consume food which is rich in carbohydrates and sugar and few patients in rural areas attend physical activity programs. Some rural participants reported that patients were not able to reduce their weight as they were not involved in any physical activity.

For example, RHCP6 commented:

> *From my experience of 10 years in the rural hospital working as a nurse, the patients have not been taking care for their health despite being diagnosed with T2DM. They do not actively involve themselves in physical exercise and they also have not been eating health food*. (RHCP6)

In contrast, some urban nurses suggested most patients are aware of self-care programs when they are diagnosed with T2DM. The findings found that most urban patients enrol in physical activity programs and maintain healthy diets. Unlike health care providers working in rural areas, those working in urban centres suggested most

T2DM patients were aware of self-care programs and only some patients engaged in physical activities and maintained healthy diets.

> *Through my practice as a nurse in the urban hospital, the patients* discrimination in urban areas *have been taking part in physical exerciseand attending gym sessions.* (UHCP1)

Self-care management in T2DM has been described as a process of increasing knowledge and awareness by developing skills and practises to manage T2DM in a social framework (Cooper et al., 2003). Since the greater part of daily care in diabetes is managed by patients and/or family members, there is a significant demand for dependable and suitable measures for self-care of diabetes (Shrivastava, 2013). There are seven important and critical self-care behaviours in individuals with diabetes (Shrivastava, 2013). These elements are healthy eating, physical activity, and regular observation of blood sugar, taking regular medications, increased problem-solving abilities, good coping skills and risk-reduction activities (AADE, 2008). These proposed actions could be helpful for both practitioners and educators taking care of individual patients and for scholars assessing new methods to care. Self-report is certainly the most practical and gainful approach to self-care appraisal and yet is frequently considered as unreliable. Diabetes self-care methods are actions carried out by individuals with or at risk of diabetes to effectively deal with the disease on their own. Hence, it is important to monitor self-care management before getting into any treatment process.

One of the major factors that manage the obstacles of diabetes is the patient's contribution to the treatment procedure which, if adhered to, has potential to increase quality of life and to reduce treatment costs. Since diabetes is a lifetime disease with no cure, poor adherence to treatment is the main reason for poor long-term outcomes (Bcheraoui et al., 2014). Abotalebi (2009) suggests the primary reason for mortality in diabetes is poor self-care behaviour. Poor self-care among diabetics is considered to be the most important issue health care provider's experience. According to a Taiwanese study, diabetics have limited self-care practises and Taiwanese patients do not contribute in day care practice while the treatment effects of diabetes depends largely onself-care behaviours (Ouyang, 2007). This is similar to the findings of the current study, that is, the importance of self-care management is still not clearly

understood by patients. One of the HCPs in the current study reported that most rural patients do not know how to care for themselves when diagnosed with T2DM. Few participants in rural areas attend physical exercise programs, while other management and treatment strategies are also poorly untaken and/or understood. Effective self-management of T2DM has long been recognized as fundamental and necessary in the maintenance and prevention of diabetic consequences. Males in rural regions were less likely adhere to self-care practises.

There are opportunities to progressT2DM self-care practises in rural Saudi Arabia and increase the ratio of patients who accomplish better glycaemic control. Eating a healthy diet, intensely maintaining an optimal diet and engaging in physical activities are some of the major self-care activities patients and health care providers discussed in the current study. However, participants in the study suggested it can be difficult to maintain a healthy diet in Saudi Arabia as social connections are extremely important and people are likely to be present at social meetings and events at which they are requested to eat the traditional foods provided. In addition, the hot weather in Saudi Arabia makes physical activity such as walking difficult. Moreover, Saudi Arabian culture is comparatively different from Asian culture in that it does not promote other kinds of healthy activities for elderly people, for example, yoga. The findings of the current study emphasized that urban patients are aware of self-care programs. Some urban patients are involved in sporting activities and have adopted a healthy diet. However, the study found that most rural patients were not involved in sporting activities as they feel discriminated against by members of society. They have also found it difficult to adopt a healthy diet. Therefore, there is a need to create an awareness program for rural areas to help enlighten the population about ways to manage diabetes.

Patients' capability to comprehend and perform their individual treatment regimens is important to control and avoids serious consequences of diabetes mellitus. To endorse self-management, it is recommended that health care institutions formulate a statement of short-range and long-standing goals specialised to meet each patient's requirements. These goals should incorporate the patient's medication use, dietary plan, lifestyle, monitoring demands, inclusive dilated visual assessment every year and podiatry care. Self-management is regarded as the keystone of effective diabetic control and there is a demand for all health care

providers to reorganize current practises in the conception of self-care in chronic disease management, particularly diabetes. It is currently identified that patient education regarding nutritional food and exercise are important tools for the management of T2DM.

5.3.3 To explore barriers and enablers associated with the management of T2DM identified by male T2DM patients in the KSA

5.3.3.1 Research Objective 3

Identifying barriers and enablers associated with the management of T2DM among Saudi people was the third objective of the current study. The Theoretical Model, 'Influences of T2DM', developed from the study findings highlights barriers and enablers. Both health care providers and patients discussed many barriers and enablers to T2DM management, which include rapid lifestyle changes, urbanisation, lack of physical activity and food consumption. Effective control and prevention of diabetes calls for a number of self-management tasks which include intake of medication, following a healthy diet and physical activity, regular foot care and attending the health care centre and monitoring health checks. Patients recognised the consequence of managing their diabetes, however various factors hindered them to regularly adhere to appropriate maintenance. Therefore, it is necessary to implement the cultural practises in the self-care programs in the plans to educate the patients on T2DM management. A healthy diet is a crucial self-care practice that contributes significantly to managing T2DM. It was observed that physical activity would be beneficial when combined with a healthy diet. It is anticipated that with proper management, the overall influence of behaviour and practises of patients can be tackled in a more holistic approach.

The current study also found unhealthy diet to be a large barrier in rural areas. This was associated with poor levels of knowledge in addition to the typeof food prepared by family and community. The current study also identified a lack of mediacation in public hospitals and health care centres as a challenge in management of T2DM in rural areas. Purchasing drugs elsewhere was considered too expensive for many participants.

The current study also identified lack of infrastructure essential in management of T2DM, like the gym centres and the big playfields. It has hindered the rural population in realising physical activity is necessary for their daily health. Finally, the currentstudy found that in the rural areas finance is another challenge that hinders the management of T2DM. The majority of the population in the rural areas are dependent on family and hence this increases the financial burden to those employed and the family members. In contrast urban participants did not identify economic issues associated with the management of T2DM.

5.3.4 To identify the perceptions of male T2DM patients from the KSA on the health care system in the provision of services and the influences of health care providers on patients decisions regarding T2DM management

5.3.4.1 Research Objective 4

Regardless of theincrease in prevelance research suggested that high rates of death due to T2DM can be managed through self care programs.In low- and middle-income nations the fundamental care level of the health structure, which should contribute in providing these interventions, does not always function well. An assessment of the volume of primary care services in eight low- and middle-income regions reported the most important discrepancies in funding for health care, service delivery, use of primary technologies and medications, medicinal information systems and the health care workforce (WHO, 2013). The health care system (HCS) in the KSA is increasing at an annual rate of 2% to address the growing demand for health care services as a result of population growth and an increase in chronic diseases (Al-Rubeaan, 2015). The government health care system in the KSA provides free health care services to Saudi people by means of public hospitals and primary health care centres (PHCCs), such as the MOH and University Health Institutions. In addition, the private health care industry, through clinical centres and hospitals, comprises 31.1% of the total health care services available in the KSA during 2013 (Al-Rubeaan, 2015). While medication for T2DM in rural Saudi regions is provided free from health facilities, it is often out of stock, forcing patients to purchase medicine or other medical alternatives from very costly places.

T2DM, as the most widespread chronic disease in the Kingdom, has an important impact on the nation's HCS and entire economy (Alhowaish, 2013). This

is highlighted by the prevalence of T2DM; 25.4% of Saudi citizens are affected by T2DM when they reach 30 years of age (Al-Rubeaan et al., 2010). The majority of participants in the current study were aware that the MOH in the Kingdom has put a lot of effort into the treatment of diabetes. One of the most notable efforts is financial support for community-based awareness raising strategies executed by community health workers. Further, the MOH supplies affordable medical treatment by facilitating free treatments in the local health care centres.

The KSA is obviously one of the regions that facilitate a free health care service to its own people. Studies by Stark et al. (2012) and Venkataraman et al.(2010) emphasized that around 90% of diabetic patients in the KSA are provided health care by means of governmental health care institutions, which is considerably more than many other developing and developed countries. There is an essential demand to place large importance on health insurance in order for patients to get involved in treatment processes of T2DM on a regular basis. This will influence a positive effect on the quality of health care facilities and whole economy among this rapidly increasing population, with more demand for health care facilities. It is also essential for policy makers to authorise the role of health insurance providers to change the Kingdom's solely public payer system to a covered health care service entailing the private sector and accordingly, improving health care services in the KSA. Besides, the private sector has a very minimal share of diabetes care in the Kingdom and must be effectively persuaded to experience the huge stress in the provision of T2DM health care services. A well-designed conversion from governmental to private sector could possibly enhance the health care quality and might have an optimistic effect on the patients' health (Basu, 2012).

Adopting a new approach of enforcing medicinal insurance to T2DM patients will possibly facilitate giving good health care services delivery in various health settings (Sosa-Rubi, 2009). This study found availability of well-equipped health care services within the urban areas to be much greater than in rural areas. Further, the health care providers within these health care institutions were considered to bewell trained and capable of treating patients effectively. The majority of urban participants were aware that the health care services provided the most recent drug treatments for T2DM and associated conditions. Given that diabetes care entails a

number of medical disciplines including ophthalmology, nephrology among others,specialised diabetes health centres and diabetes clinics are considered necessary to act as linking organisations (AlHabdan, 2016).Although health care calls for diabetic patient management at an international level have experienced an apparent shift to the primary and tertiary health care levels, T2DM patients in Saudi are still getting services at secondary or at times tertiary levels (Al-Rubeaan, 2015).There is a lack of studies which have explored the health care services delivered to diabetic patients in the KSA.This study has explored patients and health care providers perceptions around the quality of health care available in KSA.

In terms of practitioner education, the majority of participants agreed that education and proficiency level of practitioners were sound, which is similar to the findings of Asiri (2015). Asiri's findings emphasised that educational status of health care practitioners contributes to the success ratio of diabetes outcomes. In this regard, PHC centres contribute in facilitating diabetic educational programs. It is important for PHC centres to implement effective diabetes education programs to assist nurses and other professionals to educate diabetes patients appropriately. In Saudi Arabia, the health care centres do not give sufficient awareness and maintenance plans to educate patients with diabetes (Asiri, 2015). HCPs can enhance knowledge of patients with diabetes to help support them in treating their diabetes properly. Many private health centres, for example the International Medical Centre, Jeddah, have educational and training programs for diabetes management (Murad et al., 2014). In addition, there is an electronic website, popularly termed as Saudi National Diabetes Registry that particularly concentrates on e-health services, which were not accessible in other areas of Saudi Arabia, particularly the Southern region (Subhani, 2010). This e-system works as a monitoring tool for health, societal and cultural bases for both primary and secondary prevention management programs (Al-Rubeaan et al., 2013). Practitioners have an important role by utilising educational programs to intensify patients' awareness regarding diabetes management and encouraging them. This educational course of action will possibly support PHC managers, nurses and other health care providers transform their actions to help clients transform their behaviour for dealing with their diabetes.

Above all, community contribution is considered as an imperative element of PHC. Consequently, to create possible community participation, it is fundamental to engage the experts and the community leaders in planning, executing and assessing the local diabetic program at the health care centre level. If this system comes to practice, there will certainly be no need of fear about discrimination among community members. Participants agree that they receive special care by their family members when they need it most. The majority of the participants reported that wives, children and even parents are taking good care of them when they need T2DM care. This is similar to the findings of a study carried out by Asiri (2015), which found that family support contributes in changing behaviour and accomplishing goals for Saudi patients. Some participants in the current study emphasised that close relations encourage them that through careful management so they could lead a healthy and comfortable life.

5.3.4.2 Acceptance of the disease related influencers

T2DM has considerable impact on the patient's quality of life. Its unrelieved nature, incurability and issues abate the motivation of patients to deal with the disorder and its acceptance. As a result of the chronic nature of diabetes and its many complications, the disease evokes a range of mental and physical health issues.Awodele's (2015) finding highlights the perceptions of health care providers that most patients do not accept the condition. Health care providers from rural areas suggested that the majority of patients are not aware of symptoms and hence are surprised at their diagnosis, making them more likely to struggle with their diagnosis and subsequent management. Findings emphasised that they were also likely to ignore health care advice given by the health care providers.

Assessment of the quality of life among T2DM patients should be extended particularly to treatment access, education and finance burden. According to Kupcewicz and Abramowicz (2015), the interdependence is defined by the point that, with age, other emerging disorders, for example neurological disorders, age and even with financial burdens increase. According to Juczyński (2001), non-acceptance of disease negatively influences self-esteem and extends a sensitivity of dependence on others. This is confirmed by results of Ragoon et al. (2017), particularly amongst persons over 60 years of age. Similarly, King et al. (2003) suggests that a patient

who considers his disease as “a challenge worth their attempts” is likely to have a higher possibility of accepting it. However, in the current study, health care providers in rural areas indicated that majority of the patients do not accept that they may be suffering T2DM and reject their condition when diagnosed. They also fail to follow the advice given by the HCPs. Some urban participants were also hesitant to accept that they are suffering with disease. Patients who accept the disease are more likely to be motivated to manage their T2DM.

5.3.5 To explore health care providers’ perceptions of the quality of health services, barriersand facilitators to self-management and how this impacts T2DM patients from urban and rural health care systems in the KSA.

5.3.5.1 Research Objective 5

It is clear from the study by Al-Khaldi et al. (2002that general practitioners provide health care to most T2DM patients and consequently, executing policies to improve their system and executing diabetes management components will have some bearing on the quality of care. As diabetes is a chronic condition that requires ongoing assessment and management, a better medical care system that incorporates both primary and secondary prevention measures is needed.Studies from Asia and Saudi Arabia, found that various procedures such as laboratory investigations have been below the national targets as a result of inadequate coordination between the Primary Health Care Centres (PHCCs) and the local hospitals (Al-Khaldi, 2014). Good self care practises and better treatment depend significantly on the available health facilities and physical exercise facilities (Scientific Committee, 2001). Previous studies exhibited that poor treatment and self care management process is attributed to lack of sufficient and fundamental infrastructures for diabetic treatment (Al-Khaldi, 2002). The effect of mini-clinics on diabetic treatment was assessed in one large health care centre in Saudi; it was found that such kinds of practice largely intensified the diabetic care (Khan and Al-Khaldi 2002). To establish the right quality care for T2DM, it is essential to conduct well planned training programs for general practitioners on diabetes. Health education is ultimately considered as the keystone of effective diabetes management. Absence of health educators and poor health education resources is likely to contribute to a lack of health education

programs. To accomplish good quality health care education for diabetics, it is necessary to educate all practitioners working within diabetic clinics.

Health care practitioners in this study were engaged in the provision of health educationto patients with T2DM. However practitioners highlighted a lack of resources and discussed the need for ongoing professional developmentfor all professionals working in hospitals and clinics. Given the difference in levels of knowledge among rural and urban participants of this study it would be appropriate to consider different types of resources and strategies to ensure informationis relevant. While HCP were appreciative of the facilities provided, they did highlight that facilities in rural areas were not always as well maintained. In particular, in rural areas free medication was sometimes not available. This made management of T2DM difficult for some rural patients who did not have the capacity or resources to travel to urban areas to obtain medication.

5.3.6 To develop theory understand self-management practises among male T2DM patients in Saudi Arabia to inform health care provision

5.3.6.1 Research Objective 6

The last objective of the current study was to develop theory to understand self-management practisesamong male T2DM patients in Saudi Arabia to inform health care provision. According to the current study, education is considered to be an important element in increasing self-management activities. The research highlights that the learning in terms of risk factors of diabetes and its preventive actions are the primary step in prevention, as it will facilitate informed decision making associated with healthy lifestyles (Bowman et al., 2003). Patient education is always regarded as a significant factor of diabetes management. There is capacity for increasing the educational awareness in terms of diabetes through official, well-organized methods by health care providers in hospitals, clinical centres and community-based health care institutions. The current study found that health care providers should create awareness amongst the population in terms of causes, signs and alternative management practises of dealing with T2DM. The experts emphasised that there must be different awareness programs regarding the disease, causes, prevention and consequences. This is so education is a major requirement for the right management of T2DM, as educated people help the HCPs to give proper

treatment. Besides, the findings presented highlight that for the prevention of the disease it is important to change the consumption of food habits and participate in various physical activities. The health care providers in the current study recommended that it is essential for MoH to spread awareness education on T2DM, which could emphasize prevention, healthy eating, physical exercises and medication.

The current study recommended that there is need to ensure that the entire population be trained on the importance of early testing of T2DM as the first step in management. The current study also recommends that the health facility needs to be equipped with well trained health care providers. These other health care providers may include nutritionists. The study also recommended that there is need of access to health food which is important in management of T2DM. This is because other studies have found that healthy eating is a key to management of T2DM.The current study also recommends that the access of physical activities for both rural and urban patients is an instrument in management of T2DM.

This study has developed three interrelatedmodels to help understand the influences of T2DM among rural and urban patients. The models highlight the similarities between the perception of urban and rural patients and HCP. All groups perceived that *knowledge and attitude*, *physical activity* and *healthy eating* were key influences on T2DM management.Data from patients also highlighted the influenceof *health service management*. Rural participants were also influencedby *financial* issues. HCPs also recognised the importance of *awareness and education*; *self-care*; *acceptance of the disease*; *medication*; and *family and society*. These key influences will be useful to inform the development of interventions and policy.

5.4 Summary

Findings of this study and of the literature highlight the influence of knowledge and attitude and the need for physical activity and health eating to manage T2DM. This study found some key differences between rural and urban patients, with these findings being triangulated by data from urban and rural patients and HCPs. Rural patients generally had poorer knowledge and attitudes and were less likely to consume healthy food and to be physically active. All patients accessed

health care servicesafter diagnosis, however rural services sometimes lacked infrastructure and medications. Rural patients were also impacted by a lack of medications in some instances. Financial issues were also more common for rural participants. Sub-themes within the broader themes highlighted the influencefrom an individual, family and societal level. These findings highlight the need for comprehensive, ecologically-based interventions that include focus on individuals, family, community, health care providers and at broader policy and administrative levels.

Chapter 6 Conclusion and Recommendations

6.1 Introduction

The objective of the study was to evaluate the knowledge, attitude, and practices (KAP) of urban and rural males from Riyadh, Saudi Arabia regarding their type 2 diabetes management (T2DM). The study highlights the gaps in knowledge and awareness about T2DM and the influences on managementin the Kingdom of Saudi Arabia (KSA). Public health intervention measures are necessary for the KSA to address the lack of knowledge associated with T2DM causes and prevention measures. Imparting knowledge and creating awareness in the population concerning the causes, symptoms, treatment, and self-care management of type 2 diabetes is necessary. Interventions focusing on individual, family, health care professional and the broader community are necessary. Focus on national policy is also imperative.

6.2 Knowledge and Attitudes about the Prevention and Management of Type 2 Diabetes

The study revealed that t awareness of T2DM symptoms and management strategies among the study participants residing in rural areas was limited. Family members had limited knowledge concerning T2DM management. The low awareness and knowledge levels about T2DM-related information among Saudi Arabia's population, necessitates the institution of comprehensive awareness program. Moreover, the study revealed that rural participants lacked information regarding unhealthy diet as one of the risk factors of T2DM. Unhealthy diet has a direct correlation with the cultural practice in the KSA, which advocates for high-fat content diet.

The healthcare providers affirmed that the population in the rural areas had limited awareness of T2DM and hinted at the development of awareness programs for the targeted area. They presented awareness programs that would entail physical activity, dietary intake, regular intake of therapeutic medicine, and maintaining the required body weight. Moreover, the government and other healthcare stakeholders should play an essential role in addressing the lack of knowledge and awareness of

T2DM. The intervention measures should encompass T2DM causes, symptoms, treatment, and self-care management.

Similarly, the findings revealed limited or lack of support from family members to help patients manage T2DM. Inadequate family support subjects patients to greater risks of exposure and poor management of the condition. In this regard, there is a need for the MoH to involve family members in sensitisation and intervention programs to help the patients and family members to manage the condition. Furthermore, family members should be guided on how to care for T2DM family members to enable the latter to lead a long and healthy life.

The fundamental points to note from the findings, which are necessary for consideration in comprehensive T2DM management in the KSA, include a balanced diet, T2DM education, and the involvement of the government through the Ministry of Health. Essentially, the participation of the healthcare professionals and family members in the whole spectrum of diabetic management is a significant undertaking, which underpins the objective and recommendations of this study. Since effective healthcare intervention measures require the involvement of all the stakeholders from the patients, family members, healthcare professionals, and policymakers at the Ministry level, this study represents a call to action the healthcare sector in the KSA since the nation is not proactive in increasing awareness about, and managementof, T2DM.

In this respect, it is imperative to note that effective and efficient diabetes management commences with awareness and education programs, with the emphasis on regular diabetes checkups and examinations. In rural areas where lack of information and awareness concerning diabetes management is prevalent, the education program should be a targeted one with the focus on rural communities. In this regard, the educational measures must begin from the provincial level cascading downwards to the rural communities, villages, homes, and families to reach the targeted population as appropriate.

Analytically and medically, T2DM is a chronic medical condition that requires sustained and enduring managed care. Therefore, self-managed care requires

early medical interventions and the involvement of the family members and other external stakeholders in earnest to generate positive impact. Evidently, poor diagnosis and management of T2DM type 2 diabetes has adverse effects on patients, family members, and government since it leads to death and loss of a productive workforce. For the rural population in the KSA who are adversely affected by T2DM compared to the urban dwellers, targeted educational intervention for awareness creation must include factors such as the meaning of T2DM, signs and symptoms, causes, risk factors, complications, and prevention programs.

An educational intervention program, funded and facilitated through the Ministry of Health, could enhance population-based awareness of the disease. At the level of comprehending the condition, the targeted population should understand that T2DM affects how the human body metabolises sugar, which is critical for survival. When the body cannot produce enough insulin required for proper glucose level maintenance, the patient is regarded as suffering from diabetes. On the same note, since the majority of the patients are not aware they have diabetes; the educational intervention measures must focus on the signs and symptoms. The rural population in the KSA should be equipped with the information about the symptoms of the disease including frequent thirst, fatigue, blurred vision, increased hunger, slow-healing sores, unintended weight loss, frequent urination, and darkening skin, especially in the armpit and neck regions. With this information, the healthcare providers and the Ministry of Health shall have informed the population the provisionary conclusions to make concerning T2DM management. Equally essential and fundamentally critical to incorporate in the educational and awareness intervention programs are the risk factors.

The findings revealed a significant lack of awareness of T2DM management. Thus, the patients and their family members must be sensitised about the risks factors that increase their chances of suffering from diabetes including excess weight, excess abdominal fat, inactivity, family history, age, and ethnicity among others. Besides, educational intervention programs need to incorporate complications of T2DM such as nerve damage, eye damage, poor hearing, kidney damage, heart and blood vessel complication, and hearing loss among other complex challenges. Ultimately, the educational program should foucs on T2DM prevention measures including

becoming active, eating healthy food, losing unnecessary weight, and avoiding a sedentary lifestyle.

Since the study found the level of education and awareness about T2DM was low, incorporating the disease overview, symptoms, causes, risk factors, complications, and prevention in the comprehensive intervention plan would enhance the likelihood of the Ministry of Health, healthcare professionals, patients, and families to manage the disease comprehensively. Therefore, the results contained significant and useful data that can inform the recommendations. Because of this, this study presents a range of strategies for implementation to enhance awareness and improve environmental and organizationalfactors that can enhance T2DMmanagement in the KSA.

6.3 Recommendations

Although the study demonstrated that there was an increase in T2DM in rural and urban areas in the KSA, the rural population suffered the disease burden disproportionately. On the same note, the findings evidenced that the level of education and awareness concerning T2DM was limited in the two environments; however, the rural population faced high lack awareness compared to the urban dwellers. Therefore, this section of the research summarizes the findings and introduces recommendations for the patients, care providers, and the government. The goal is to institute appropriate and comprehensive T2DM management for future practices and research in the KSA.

6.3.1 Recommendations for Patients

T2DM is increasing dramatically among young adults aged 35 and advances in severity and prevalence with age. Sharaf (2012) corroborates this finding when he establishes that T2DM is prevalent among young adults aged 35 years and above. Hence, the recommendations for the patients focus on the educational and awareness intervention programs that increases regular diabetes screening for signs and symptoms and complications. The study incorporated participants in rural and urban

settings. T2DM awareness and education were insufficient among the population in the rural environment. Hence, it is recommended that every rural community who is 35 years and above should undergo mandatory T2DM screening.

Further, the study recommends the adoption of healthy practices to reduce risk factors associated with the disease burden. The adoption of healthy practices should entail T2DM prevention and management programs that are not in conflict with the cultures in the Kingdom of Saudi Arabia. Similarly, the study recommends the immediate implementation a national intervention program that will concentrate on high-risk groups to monitor T2DM and adoptable risk factors for early prevention. Moreover, it is recommended that the community members, families, and patients undergo awareness and education on the importance of healthy diet and physical activities as prevention measures to contain the spread of the disease. The healthy eating and physical activities anchors on the fundamental value of self-care as the most pragmatic intervention initiative.

6.3.2 Recommendations for Health Care Providers

Healthcare providers and professional are integral in disease prevention and management since they have direct contact with the patients in care provision and intervention programs. Because patients depend on care providers for their care needs, it is recommended that healthcare providers capitalise on trust patients have on them to educate the patients on the importance of appropriate diet, physical activity, and self-care management to fight T2DM. Similarly, it is recommended that healthcare providers undertake awareness campaigns to sensitive diabetic patients on the full spectrum T2DM prevention and intervention programs such as eating a healthy diet, getting active, losing weight, and avoiding a sedentary lifestyle. At the treatment level, which is the domain of the healthcare providers, the findings revealed that public health facilities in the KSA lacked sufficient drugs, which made the cost of treating T2DM expensive. Thus, it is recommended that the government should adequately fund and supply public healthcare facilities with sufficient medications to enhance the work of healthcare providers during diabetes management and treatment.

Because the KSA is a highly religious society, it is recommended that healthcare providers should structure the intervention and prevention measures, especially dieting and physical activities to be in line with the social and cultural practices to maximise success. Because of this, they should act as diabetes mentors who encourage patients to adhere to intervention and management plans to overcome the disease burden. Summative, the above recommendations require healthcare providers to capitalise on their education and expertise, the existing education platforms, and the resources the Ministry of Health avails to provide proper diabetes counseling, education, and treatment. These measures could enable T2DM patients to be proactive in diabetes screening, glucose checking, and comprehensive self-care.

6.3.3 Recommendations for the Government

Two vital aspects that require policy interventions emerged from the study findings namely; low level of T2DM awareness and limited knowledge on the disease overview, symptoms, causes, risk factors, complications, and prevention. Therefore, based on the findings, it is recommended that the government of the Kingdom of Saudi Arabia through the Ministry of Health should formulate public health policies for T2DM awareness and education. The formulated policies should focus on community, families, and patients as essential players in the diagnosis process. The objective of the recommendation is to ensure that the critical constituent (patients) in the diabetes management program is enlightened about the causes, symptoms, treatment, and self-care management of T2DM. Similarly, the Ministry of Health should design educational policies that sensitise people on poor dietary choices, especially foods rich in fat.

The two recommendations anchor on the premise that knowledge and education concerning the prevalence of diabetes is imperative for early comprehensive diagnosis and designing of cost-effective tools. According to Asif (2014), further studies are necessary to assess diabetes knowledge in the rural and urban settings of the KSA and the involvement of the government and healthcare providers in managing the disease. Due to this, it is recommended that the Ministry of health, in collaboration with the healthcare providers to launch media campaigns

through social media, print media, radio, and other media to educate and sensitize the public in the rural and urban areas on T2DM prevention and management.

Healthy eating is crucial for T2DM self-care and management. Brown et al. (2003) indicate that healthy eating prevents diabetes among the risk population. Since the majority of urban and rural dwellers consume a high-fat diet, it is recommended that the government should formulate policies that impose high taxation on high fat and high sugar diets to deter their purchase as an intervention measure. The cost of treating and managing chronic T2DM is unachievable for many rural and urban patients. Thus, it is also recommended that the government should provide free medical care to lower income T2DM patients as one of the methods for managing the condition.

6.3.4 Recommendation for Further study

In the KSA, socioeconomic, nutritional, and lifestyle variables interact and play fundamental roles in type 2 diabetes management. Therefore, a comprehensive study that incorporates all these variables would be of an intellectual and practical undertaking.

Future T2DM studies must explore the rural and urban population adequately. The broadened investigation that would involve all the stakeholders from the community, government, patients, families, and healthcare providers would be insightful and informative in generating conclusions for constructive T2DM management. A mixed method approach, including population based surveys supportedwith qualitiative data collection from patients, families, HCPs and government stakeholders is suggested. The findings would be of critical importance to the government of the KSA in launching result-oriented treatment, prevention, and intervention measures in the management of T2DM. Since the findings of this studyreflect variances and challenges in T2DM management and treatment in rural and urban settings, the following recommendations for further investigations are suggested:

1. Develop an evidence-based formula for determining the efficiency of physical exercise in the management of T2DMin Saudi Arabia's rural and urban areas.
2. Determine evidence-based methods for assessing the efficacy of food nutrition in the management of T2DM in the study area.
3. Determine the contribution of education awareness in the urban areas to control and management of T2DM in the study area.
4. Determine if the contribution of health practices that enhances the better management of T2DM in the study area.

6.4 Strengths and Limitations of the Study

The study emphasised the significant value of knowledge and awareness concerning T2DM management among the Saudi population. The research also stressed the positive contribution of policies and procedures that factor education and awareness during disease management. Besides, the study highlighted the involvement of stakeholders such as patients, communities, families, healthcare providers, and government in the T2DM management programs among the rural and urban population. The study was however, limited to male patients aged 35-65 years in rural and urban settings in Riyadh, KSA. The qualitative nature of the study means findings are not generalisable; however, the large qualitative sample size enhances the likelihood that the study is representative. Further quantitative studies to gather population level data will support the findings of this study.

APPENDICES

Appendix A Information sheet for participant inArabic

معلومات للمشاركين في الاستبيان

عنوان المشروع:

فهم المعرفة والاساليب والممارسات المتعلقة بالمرضى

الذكور الذي يعانون من داء السكر النوع الثاني في منطقة الرياض بالمملكة العربية السعودية:استكشاف نوعي

فريق البحث:

عبدالرحمن القحطاني: طالب دكتوراه - جامعة كيرتن-صحة المجتمع

الاستاذ المشارك:ماريو سوارس- جامعة كيرتن-صحة المجتمع

الاستاذة المشاركه: شيرين بيرنز- جامعة كيرتن-صحة المجتمع

الاستاذة المشاركة:ليند سيلفي - جامعة كيرتن-صحة المجتمع

الاستاذ المساعد:سمير الحامد - جامعة كيرتن-صحة المجتمع

حول هذه الدراسة:

هذا مشروع بحث دكتوراة في الفلسفة في جامعة كيرتن تحت اشراف فريق بحث وستسخدم نتائج هذا البحث من قبل طالب الدكتوراة عبدالرحمن القحطاني و هذا المشروع ممول من الحكومة السعودية.

وصف مشروع الدراسة:

هذا المشروع الذي هو فهم المعرفة والاساليب والممارسات المتعلقة بالمرضى الذكور الذي يعانون من داء السكر النوع الثاني في منطقة الرياض بالمملكة العربية السعودية:استكشاف نوعي: لفهم مدى معرفة واساليب وممارسات هؤلاء المرضى الذكور اللتي اعمارهم مابين 35 و65 سنة وسعوديين الجنسية و مشخص حالتهم بهذا المرض من سنة كحد ادنى ويقطنون الاماكن الريفية والمتحضرة من منطقة الرياض بالاضافة الى الطواقم الطبية المشاركة في علاج هؤلاء المرض في المراكز المختارة.

الغرض من هذه الدراسة:

صممت هذه الدراسة لفهم بطريقة اكثر اتساعا واشمل معرفة واساليب وممارسة هؤلاء المرضى الذين يعانون من داء السكري النوع الثاني مما سيساعد في تحدث هؤلاء المرضى عن انفسهم بحرية كاملة و ذالك للتحكم في هذا المرض ومنع مظاعفاته وتطوير مجال عملي للطواقم الطبية وتطوير البرامج الصحية ذات العلاقة بهذا المرض والتمكن من تقييم العوامل المساعدة والمعوقات المؤثرة على الادارة الذاتية لهذا المرض.

ماذا يراد مني ان افعل:

انت مدعو لمقابلة فردية شخصية فيما يتعلق بعنوان هذا المشروع ومن سيقوم بمقابلتك هو طالب دكتوراة من جامعة كيرتن الاسترالية.وستسجل هذه المقابلة لمدة بين 45 الى 60 دقيقةفي الوقت الذي يناسبك. بعد التسجيل سيتم كتابة التسجيل ويحفظ بكمبيوتر وسيتلف بعد الانتهاء من الدراسة.

ماذا سأستفيد من المشاركة في هذه الدراسة:

قد لايكون هناك فائدة مباشرة من المشاركة في هذه المقابلة ولكن مشاركتنا معلوماتك وخبراتك مع هذا المرض ستساعد للتحكم في هذا المرض ومنع مظاعفاته وتطوير مجال عملي للطواقم الطبية وتطوير البرامج الصحية ذات العلاقة بهذا المرض والتمكن من تقييم العوامل المساعدة والمعوقات المؤثرة على الادارة الذاتية لهذا المرض.في النهاية سيتم اعطائك قلماو كأس كتقدير لمشاركتك.

هل ستكون هويته معروفة بمجرد مشاركتي في هذه الدراسة:

لانحتاج اسمك في هذه المقابلة ومنذ ان نكتب التسجيل سنتلف الملف الصوتي وجميع محتويات التسجيل تبقى سرية ولن يتم الافصاح عن شيء من المعلومات اللتي قد تدل على شخصيتكحيث سيتعامل مع المعلومات يسرية وخصوصية تامة. ولن يتم نشر الهوية في اي من منشورات البحث. وسيتم حفظ هذه المعلومات في مركز للبيانات مركزي يستطيع فقط ان يراه الاعضاء المشاركين في البحثحيث سيخزن في جامعة كيرتن الاسترالية. وسيكون التسجيل والكتابة محفوظة برمز معين وذالك لحفظ هويتك ولن يصل الى هذه المعلومات الا مركز ترجمة معتمد ان احتجنا ذالك. وبأمكانك الاستماع الى التسجيل ان رغبت بعد الانتهاء من المقابلة.

كيف اوافق على المشاركة؟

تستطيع المشاركة بحرية وطواعية كاملة من دون اي ضغوطات و عدم موافقتك للمقابلة سيكون مقبولا من دون اي تضجر.لذاك عند مشاركتك تستطيع الانسحاب في اي وقت اردت من دون اي محاسبة او مسائلة.

كيف استطيع الحصول على معلومات اضافية عن هذه الدراسة؟

بأستطاعتك الاتصال على الاستاذ المساعد شيرين بيرنز على:

+61 8 9266 4123 or s.burns@curtin.edu.au

التساؤلات و الشكاوى؟:

هذا البحث مدقق وموافق عليه من لجنة اخلاقيات البحث و المشاركين في جامعة كيرتن الاسترالية. وذالك طبقا لنضام اخلاقيات البحث في 2007 فأذا كان عندك اي تساؤلات او شكوى و ترغب في الاتصال بشخص ليس له علاقة بالبحث او الشكوى فقد تستطيع بالاتصال بأحد المسئولين في لجنة اخلاقيات البحث وسيتعامل معه بسرية تامة وتبلغ بنتائجه:

+61 8 9266 2784 or by emailinghrec@curtin.edu.au

شكرا جزيلا لوقتك الثمين الذي امضيته في قراة هذه المعلومات متمنيا قبولك للمشاركة في هذه الدراسة

Appendix A1 Participant Information Sheet in English

Participant Information Sheet

Title:Knowledge, Attitude and Practice regarding type-2 diabetes mellitus (T2DM) among male patients in Riyadh, Saudi Arabia; a qualitative exploration

Research Team:

PhD Student; Abdulrahman Alqahtani,	1072 School of Public Health
Chairperson: APROF Mario Soares	1072 School of Public Health
Supervisor: APROF Sharyn Burns	1072 School of Public Health
Co-Supervisor: APROF Linda Selvey	1072 School of Public Health
Associate Sup (Ext): DR Sameer Al Hamid	1072 School of Public Health

About this study:

This is a supervised doctoral research project and the results of ths research project will by used by Abdulrahman Alqahtani to obtain a Doctor of Philosophy at Curtin University. This project is funded by the embassy of Saudi Arabia in Australia.

Description of the study:

This study will collect qualitative data via semi-structured one-on-one interviews from Saudi males who are aged between 35 to 65 years old and diagnosed with T2DM for a minimum of one year living in urban and rural areas of Riyadh-Region Saudi Arabia. Health care providers who are involved in the treatment of these patients and working in the selected health care centers will also be invited to participate in the study.

Purpose of the study:

This study is designed to further our understanding as to how to best assist T2DM patients in order to manage this disease and prevent its future complications and help inform programs to manage T2DM. This study will provide the opportunity for you to discuss your knowledge, attitude, and practice

of T2DM. This study will also develop a framework for health care providers to enable the assessment of barriers and enablers to self-management of T2DM.

What will I be asked to do?

You are invited to attend a one-on-one interview discussing your knowledge, attitude, and practice (KAP) of T2DM. You will be interviewed by Curtin University PhD student, Abdulrahman Alqahtani. The interview will be audio-recorded and will take about forty five to sixty minutes at a time convenient for you. Once recorded, the interview will be transcribed and stored as a computer file or external hard desk to be saved on a password protected secure network at Curtin University then to be destroyed once the results have been finalized.The health care centers will be from rural and urban areas of Riyadh regions (from north, south, west, east and the middle areas)

What benefit will I gain from being involved in this study?

There may be no direct benefit to you associated with this study but the sharing of your experiences will help the development of a framework for health care providers to enable the assessment of barriers and enablers to self-management of T2DM and improve the management of T2DM patients and improving prevention program to prevent this disease.

Will I be identifiable by being involved in this study?

We do not need your name and you will be anonymous. The interview will be recorded, transcribed and saved as a computer file. At the end of the study your voice file will be destroyed. All records containing personal information will remain confidential and no information that could lead to your identification will be released. We will treat any information provided in the strictest confidence and no-one will be individually identifiable in any publications from this research project. To ensure your confidentiality all data will be only available to the research team members and will be saved on a password protected secure network at Curtin University. The recording and transcript of your interview will be labelled with a pseudonym to protect your identity as we will be making the recording available to authorized translator for transcription if needed. If you wish, you can listen your audio recording after the interview.

How do I agree to participate?

You are under no obligation to be interviewed. Your involvement in this study is entirely voluntary, and your non-participation will be accepted without any reasons or blame. If you decide to participate you can withdraw from the study at any time freely and without any penalty.

How can I find out more information?

Should you require future details about the project please contact Associate Professor Sharyn Burns on +61 8 9266 4123 or s.burns@curtin.edu.au.

Concerns or complaints?

Curtin University Human Research Ethics Committee (HREC) has approved this study (#REC-4.11.2015[RDHS-258-15]). All research in Australia involving humans is reviewed by an independent group of people called a Human Research Ethics Committee (HREC). The ethical aspects of this research project have been approved by the Curtin University HREC. This project will be carried out according to the National Statement on Ethical Conduct in Human Research (2007). If you have any concern and complaints about the project , the way it is being conducted or your right as a research participant, and would like to speak to someone independent of the project, please contact: Curtin University Ethics Committee by telephoning +61892662784 or by emailing: hrec@curtin.edu.au

Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

Thank you for taking the time to read this information sheet and we hope that you will accept our invitation to be involved.

Appendix B Interview guide for Healthcare Practioners

Question to assess Health Care Providers' perception	
	1-Do you usually discuss with T2DM patients about the medication youordered and their instruction? 2-Do you use family history to personalize preventive messages? 3- What is the most important or necessary information to improve diabetes self-management in adults with T2DM? 4-What are the factors that motivate adults with T2DM to start or maintain diabetes self-management? 5-What makes it easy for adults T2DM patients to manage their diabetes? 6-What makes it hard or difficult for adults with T2DM to manage their diabetes? 7-What are your experiences of support given to prevent T2DM patients? 8-Can you please let me know your views about barriers and enablers to support and educate the T2DM patient in Saudi Arabia?

Appendix C Interview guide for Patients

Question to assess patients' experience with T2DM	
Disease-related questions (including knowledge, attitude, and behaviours, prevention, self-care management, and medications).	1-Tell me about what you know about diabetes? 2. Who do you think is at greatest risk of developing diabetes? Why? 3-Tell me how you felt when you were first diagnosed with diabetes? 4-How did it make you feel about yourself? 5-How did your family react to the news? 6-How did your reaction to your diagnosis impact on your management of the disease? 7-What changes have you made to your lifestyle since being diagnosed? 8-Tell me about how these changes have impacted your feelings about yourself? 9-Tell me about how these changes have impacted your family? 10-What do you think you do best in your self-management of your diabetes? Why? 11-What part of your self-management do you think you do worse? Why? 12-What advice would you give younger members of your family about preventing diabetes?
Physical activity-related questions	1-What types of exercise are you presently doing? 2-Do you do any exercise or take part in any sports?

	3-Would you like to be more physically active? 4-Would you like to do more exercise? 5-What do you think prevents you from taking exercise? 6-What would help or encourage you to do more exercise? 7-Why have you decided to continue (or stop) exercising? 8- How have you managed to integrate exercising in your daily life?
Nutrition-related questions	1-When you think of eating, what words come to mind? 2-How does your diabetes affect the types of foods you choose? 3-Are there foods that you associate as being good for a person with diabetes? 4-Are there foods that you associate as being bad for a person with diabetes? 5-What types of home remedies do you use for your diabetes? 6-Do you follow any special type of diet? Tell me about that. 7-How do you decide what to eat?

Appendix D 1 Consent form of the Interview in English

CONSENT FORM OF THE INTERVIEW FORPARTICIPANTS

Title:Knowledge, Attitude and Practice regarding type-2 diabetes mellitus (T2DM)

among male patients in Riyadh, Saudi Arabia; a qualitative exploration

I have been given clear, written information about this research project and have been given time to consider whether or not I wish to take part.

I understand this is a supervised doctoral research project and the results of this research project will be used by Abdulrahman Alqahtani to obtain a Doctor of Philosophy at Curtin University.
I understand and accept the nature of the project, which has been explained to my satisfaction. I understand that my interview discussion will be audio-taped and transcribed.

I know that my participation in this project is strictly voluntary. I know that I have the right to withdraw atany time.

If I have any questions about the project or about being a participant, I can contact Associate Professor Sharyn Burns on +61 8 9266 4123 or S.Burns@curtin.edu.au.

I understand that this project has been approved by Curtin University Human Research Ethics Committeeand will be carried out in line with the National Statement on Ethical Conduct in Human Research (2007) –updated March2014.

I know that I can contact the Research Ethics Officer at Curtin University on (+618)92662784 if I wish to discuss any aspects of the program on a confidential basis.

I agree to participate in this project. I have been assured that my identity will not be revealed whilethe program is being conducted or when the program is published – however I understand and acknowledgethis research is taking place in rural and urban medical care centers of region of Riyadh and others may be aware I amparticipating.

Participant'sName:…….. Participant'sSignature:……

Witness'sName:…….. Witness'sSignature:……
I have supplied an Information Letter and Consent Form to the participant who has signed above, andbelieve that they understand the purpose, extent and possible risks of their involvement in thisproject.

Researcher'sName: *ABDULRAHMAN ALQAHTANI*……Researcher's Signature:……
Date:_____
Please keep a copy of this form for yourrecords.

Appendix D2 Consent form for participant in Arabic

نموذج موافقة للمشاركة

اسم البحث: فهم المعرفة والاساليب والممارسات المتعلقة بالمرضى الذكور الذي يعانون من داء السكر النوع الثاني في منطقة الرياض بالمملكة العربية السعودية:استكشاف نوعي

اقر انا الموقع ادناه انني قد اعطيت معلومات واضحة و مكتوبة حول هذا المشروع البحثي واعطيت الوقت الكافي للنظر فيما اذا كنت ارغب المشاركة او لا.

وأنا افهم هذا هو مشروع بحث الدكتوراة وتحت اشراف فريق بحث وسيتم استخدام نتائج هذا المشروع البحثي عن طريق عبدالرحمن القحطاني للحصول على الدكتوراه في جامعة كيرتن.

أنا افهم واستعرض طبيعة المشروع الذي يتم شرحه بأرياحية.

وأفهم ايضا ان هذه المقابلة ستكون سمعية ومسجلة ومن ثم مكتوبة

وأنا اعلم ان مشاركتي في هذا المشروع طواعية وأعلم ايضا ان لدي حق الانسحاب في اي وقت.

اذا كان لدي اي تساؤل عن هذا المشروع بكوني مشارك فيه فأنه باستطاعتي التواصل مع

الاستاذة المشاركة شيرين بيرنز على

+61 8 9266 4123 or S.Burns@curtin.edu.au.

هذا البحث مدقق وموافق عليه من لجنة اخلاقيات البحث و المشاركين في جامعة كيرتن الاسترالية. وذالك طبقا لنضام اخلاقيات البحث في 2007 والمحدث في 2014 فأذا كان عندك اي تساؤلات او استفسارات و ترغب في الاتصال بشخص ليس له علاقة بالبحث او الشكوى فقد تستطيع بالاتصال بأحد المسئولين في لجنة اخلاقيات البحث وسيتعامل معها بسرية تامة على

+61 8 9266 2784 or by emailinghrec@curtin.edu.au

اوافق على المشاركة في هذا المشروع بالمقابلة الشخصية حيث أكد لي ان هويتي لن يتم الافصاح عنها ولن يذكر عنها اي شي في الدراسة والنشر. وافهم ان هذا البحث يجرى في المراكز الطبية في المناطق الريفية والحاظرة في منطقة الرياض والاخرين على علم بذالك.

اسم المشارك:..... التوقيع:..... التاريخ:.....

اسم الشاهد :..... التوقيع:..... التاريخ:.....

اقرار الباحث:انني وضحت للمشارك شفهيا الخطوات الموجودة في البحث وان المشارك قد فهم وأدرك ذالك.

اسم الباحث: عبدالرحمن القحطاني التوقيع:.....التاريخ:.....

Appendix E

External Investigators' Statement

Investigators form outside King Fahad Medical City (KFMC) should:

- ☐ Abide by all KFMC regulations and policies.
- ☐ Be responsible for the safe and ethical conduct of the research
- ☐ Participates in the selection of study subjects according to the recruitment strategy
- ☐ Performs and/or supervises the conduct of study-related procedures
- ☐ Monitors the safety of the study subjects and investigational staff
- ☐ Collects accurate and verifiable data and other essential study documents
- ☐ Collect data only as approved by the IRB for his/her study
- ☐ Be responsible for follow the IRB regulations and apply Good Clinical Practice standards when dealing with human subject research.
- ☐ Ensures adequate close-out of the study
- ☐ Respect all colleagues and assistant staff

I hereby state that I have read and understand the above rules, by my signing this I do agree to stick to it.

Investigator Name:Abdulrahman Alqahtani

Investigator Signature:----------

Date: (/ /)

Appendix F

King Fahad Medical City Academic & Training Affairs Research & Scientific Publication Center	مدينة الملك فهد الطبية الإدارة التنفيذية للشئون الأكاديمية والتدريب مركز البحوث والنشر العلمي

CONSENT: إقرار بالموافقة

Subject المشارك

I will receive a signed copy of this consent form.

أقر أنا بأن هذا البحث العلمي وإجراءاته قد تم شرحها لي. لقد سمح لي بأن اسأل كل سؤال لدي الآن. ويمكنني أن اسأل أي أسئلة إضافيةفي أي وقت لاحق. كما يمكنني إنهاء المشاركة في هذا البحث العلميفيأي وقت دون أنتتأثرالرعاية الصحية المقدمة لي.

سأحصل على نسخة موقعة من الإقراربالموافقة.

Subject Signature _____ توقيع المشارك _____

Date: / / التاريخ / /

Time (AM ☐ PM ☐) (م ☐ ص ☐) الوقت

Person Obtaining Consent: الشخص الحاصل علي الإقرار بالموافقة

I have explained the nature and purpose of the study and the risks involved. I have answered and will answer questions to the best of my ability. I will give a signed copy of the consent form to the subject.

أقر بأنني قدشرحت بصورة كاملة,طبيعةهذا البحث العلمي والغرض منهوما ينطوي عليه من مخاطر. ولقد أجبت على جميع الأسئلةبقدر الإمكان. سأعطي نسخة موقعة من الإقراربالموافقة للمشارك المذكور أعلاه.

Signature of Person Obtaining Consent توقيع الشخص الحاصل علي الإقرار بالموافقة

Date/ / التاريخ :/ /

Time (AM ☐ PM ☐) م ☐ ص ☐ الوقت

Principal Investigator : Abdulrahman Alqahtani الباحث الرئيس عبدالرحمن القحطاني

Signature of Principal Investigator توقيع الباحث الرئيس

Time (AM ☐ PM☐ م☐ الوقت ص☐

Appendix G

King Fahad Medical City Academic & Training Affairs Research & Scientific Publication Center	وزارة الصحة مدينة الملك فهد الطبية King Fahad Medical City	مدينة الملك فهد الطبية الإدارة التنفيذية للشئون الأكاديمية والتدريب مركز البحوث والنشر العلمي

Minimal Risk Informed Consent Template

إقرار بالموافقة المستنيرة علي المشاركة في بحث علمي يشتمل علي

Protocol Number:		رقم البحث العلمي
Name of Subject:		اسم المشارك
Medical Record Number:		رقم السجل الطبي
Study Title:		عنوان البحث العلمي
Knowledge,attitudeandpracticeregardingtype-2diabetesmellitus(T2DM)amongmalepatientsinRiyadh,SaudiArabia:a qualitativeexploration		فهم معرفةوالاساليب والممارسات المتعلقة بمرضى السكر Type 2 الذكور فيالرياض، المملكة العربية السعودية:استكشافالنوعي
Principal Investigator:	Abdulrahman Alqahtani	الباحث الرئيس:عبدالرحمن القحطاني
Address:	Riyadh-Hai AL Yarmouk	العنوان
Telephone:	+966557733962	رقم الهاتف 966557733962+

Why Is This Study Being Done? — ما سبب القيام بهذا البحث العلمي ؟

for PhD project — لاتمام دراسة وانها مشروع الدكتوراة

How Many People Will Take Part in This Study? — كم عدد الأشخاص المفترض مشاركتهم في هذا البحث العلمي؟

It is a qualitative research and number of patients could be up to 30 patients in addition to the health care providers — دراسة كيفية(نوعية)

What is involved in the Study?

ماذا يتضمن هذا البحث العلمي؟

Understanding Knowledge,attitudeandpracticeregardingtype-2diabetesmellitus(T2DM)amongmalepatientsinRiyadh,SaudiArabia:a qualitativeexploration.

فهم معرفةوالاساليب والممارسات المتعلقة بمرضى الذكور فيالرياض، المملكة العربية Type 2السكر استكشافالنوعي:السعودية

Study location:Health care centers inside Riyadh Region in 5 Urban and 5 Rural areas

في منطقة الرياض:موقع إجراء هذا البحث العلمي

What is Expected of Me During the Study?answering the questions and speaking honestly and freely

ما المطلوب مني خلالهذا البحث العلمي؟

الاجابة علو الاسئلة المطروحة والتكلم بمصداقية تامة وحرية كاملة

How Long Will I Be in This Study?

كم مدة مشاركتي في هذا البحث العلمي؟

Time will be between 45 to 60 minutes

ستكون من 45 الى 60 دقيقة

Can I Stop Being in This Study?

هل يمكنني إنهاء المشاركة في هذا البحث العلمي؟

You can decide to stop at any time. Taking part is purely voluntary.

المشاركة طوعيه محضة ويمكنك أن تنهيها في أي وقت تشاء.

What are the Benefits of This Study

ما هي فوائد هذا البحث العلمي؟

/There will be no direct benefit to you from taking part in this study. Study results may be useful to the patients in the future :

لن تكون هناك أي فائدة مباشرة لك من المشاركة في هذا البحث العلمي. نتائج هذا البحث قد تكون مفيدة للمرضى في المستقبل.

What are the Risks of This Study?

ما هي المخاطرالمتوقعة من المشاركة في هذا البحث العلمي؟

The main ethical issue that could arise within this research is that of the anonymity of the participants. Given participants will be purposively sampled from health clinics, the researcher will need to ensure that their information and privacy is protected. The participants will be given an information sheet outlining the research and a written consent form in both Arabic and English will be signed. The consent is undertaken to fully inform the participants of the research and it is a legal document to protect the participants and the researcher. As part of the consent process the researcher will also inform the participants that the findings will be written up following the completion of the research. The project team assures that your identity will not be revealed whilethe interview is being conducted – however you must understand and acknowledge thatthis research is taking

القضية الأخلاقية الأساسية التي يمكن أن تنشأ في هذا البحث هو أن من عدم الكشف عن هويته سيتم أخذ عينات المشاركين نظرا .للمشاركين قصدية من العيادات الصحية، فإن الباحث تحتاج إلى التأكد من أن المعلومات الخاصة بهم والخصوصية محمية.

وستعطى المشاركين ورقة المعلومات تحديد البحوث واستمارة موافقة خطية باللغتين العربية وتعهدت الموافقة على .والانجليزية وسيتم التوقيع إعلام بالكامل المشاركين في الأبحاث وأنه هو وثيقة كجزء من .قانونية لحماية المشاركين والباحث عملية الموافقة والباحث أيضا بإبلاغ المشاركين أنه

place in medical centers, in chosen rural or urban areas of Riyadh and your participation in this research may become public knowledge.

سيتم كتابة النتائج في أعقاب الانتهاء من البحث.

يؤكد فريق المشروع أن هويتك لن يتم الكشف عنها ولكن يجب أن نفهم - في الوقت الذي تجرى المقابلة ونعترف بأن هذه الأبحاث تجري في المراكز الطبية، في اختيار المناطق الريفية أو الحضرية في الرياض ويمكن أن تصبح مشاركتكم في هذا البحث المعرفة العامة

What if I am Injured Because I Took Part in This Study?

ماذا سيحدث إذا أصابني ضرر جراء المشاركة هذا البحث العلمي؟

If you are injured as a result of being in this study, treatment will be provided by KFMC at no cost to you.

إذا حدث أن أصبت بضرر نتيجة مشاركتك في هذا البحث العلمي، ستقدم لك مدينة الملك فهد الطبية العلاج دون أي تكلفة لك.

What are the Costs of This Study?

وما هي تكاليف المشاركة في هذا البحث العلمي؟

There are no costs to you if you take part in this study.

لا توجد تكاليف للمشاركة في هذه هذا البحث العلمي.

Will I Be Paid for Taking Part in This Study?

هل هنالك اجر مقابل المشاركة في هذا البحث العلمي؟

No

لا

What are the Alternatives?

ما هي البدائل؟

Gift as a pen or Cup

هدية قلم او كأس

Will My Information Be Kept Private?

هل سيتم الحفاظ علي معلوماتي بسرية؟

Your personal information will be kept private. It will be given out only if required by law. Your personal information will not be used in any reports.

معلوماتك الشخصية سيتم الحفاظ عليها بسرية تامة. ولا تعطي إلا إذا اقتضى الأمر وذلك في حدود النظم والقوانين المطبقة بهذا الخصوص. معلوماتك الشخصية لن تستخدم في أي تقارير.

What are My Rights if I Take Part in This Study?

ما هي حقوقي إذا شاركت في هذا البحث العلمي؟

Taking part in this study is your choice. You may choose to take part or not to take part. If you decide to take part in the study, you can quit at any time. There will be no penalty to you for your decision. Your medical care will not change.

المشاركة في هذا البحث العلمي هي بمحض اختيارك. يمكنك أن تختار المشاركة أو لا. إذا قررت أن تشارك في هذا البحث العلمي، يمكنك التوقف في أي وقت تشاء. وإذا لم تشارك لن تكون هناك أي عقوبة لك, ولا تتأثر الرعاية الطبية المقدمة لك بسبب هذا القرار.

Who Do I Call if I Have Questions or Problems? بمن يمكنني الاتصال إذا كان لدي أسئلة أو مشاكل؟

Appendix L Ministry of Health ethical approval in KSA

Curtin University

وزارة الصحة
Ministry of Health

Kingdom of Saudi Arabia
Ministry of Health
King Fahad Medical City
(162)

مدينة الملك فهد الطبية
King Fahad Medical City

المملكة العربية السعودية
وزارة الصحة
مدينة الملك فهد الطبية
(١٦٢)

IRB Registration Number with KACST, KSA: H-01-R-012
IRB Registration Number with OHRP/NIH, USA: IRB00008644
Approval Number Federal Wide Assurance NIH, USA: FWA00018774

October 14, 2015
IRB Log Number: 15-361E
Department: External
Category of Approval: EXEMPT

Dear Abdulrahman Alqahtani,

I am pleased to inform you that your submission dated October 13, 2015 for the study titled '**Understanding knowledge, attitude and practice regarding type-2 diabetes mellitus (T2DM) among male patients in Riyadh, Saudi Arabia: a qualitative exploration**' was reviewed and was approved. Please note that this approval is from the research ethics perspective only. You will still need to get permission from the head of department or unit in KFMC or an external institution to commence data collection.

We wish you well as you proceed with the study and request you to keep the IRB informed of the progress on a regular basis, using the IRB log number shown above.

Please be advised that regulations require that you submit a progress report on your research every 6 months. You are also required to submit any manuscript resulting from this research for approval by IRB before submission to journals for publication.

If you have any further questions feel free to contact me.

Sincerely yours,

F M Approved 14 OCT 2015 I R B

Prof. Omar H. Kasule
Chairman Institutional Review Board--IRB.
King Fahad Medical City, Riyadh, KSA.
Tel: + 966 1 288 9999 Ext. 26913
E-mail: okasule@kfmc.med.sa

Appendix M CurtinEthical Approval

Curtin University

وزارة الصحة
Ministry of Health

MEMORANDUM

Curtin University

To:	A/Prof Sharyn Burns School of Public Health
CC:	Mr Abdulrahman Alqahtani
From:	Professor Peter O'Leary, Chair, HREC
Subject	Ethics approval Approval number: RDHS-258-15
Date:	04-Nov-15

Office of Research and Development
Human Research Ethics Office

TELEPHONE 9266 2784
FACSIMILE 9266 3793
EMAIL hrec@curtin.edu.au

Thank you for your application submitted to the Human Research Ethics Office for the project: 6489

Understanding knowledge, attitudes and practice regarding type-2 diabetes mellitus (T2DM) among male patients in Riyadh, Saudi Arabia: a qualitative exploration

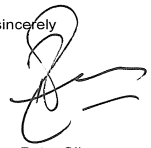
Your application has been approved through the low risk ethics approvals process at Curtin University.

Please note the following conditions of approval:

1. Approval is granted for a period of four years from **04-Nov-15** to **04-Nov-19**
2. Research must be conducted as stated in the approved protocol.
3. Any amendments to the approved protocol must be approved by the Ethics Office.
4. An annual progress report must be submitted to the Ethics Office annually, on the anniversary of approval.
5. All adverse events must be reported to the Ethics Office.
6. A completion report must be submitted to the Ethics Office on completion of the project.
7. Data must be stored in accordance with WAUSDA and Curtin University policy.
8. The Ethics Office may conduct a randomly identified audit of a proportion of research projects approved by the HREC.

Should you have any queries about the consideration of your project please contact the Ethics Support Officer for your faculty, or the Ethics Office at hrec@curtin.edu.au or on 9266 2784. All human research ethics forms and guidelines are available on the ethics website.

Yours sincerely



Professor Peter O'Leary
Chair, HREC

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